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ABSTRACT

This report explores a range of alternative futures covering the next 25 years (1975-2000). These concentrate on the United States, but place this nation's future experience in a world context. It is believed that by exploring the uncertainty of the near future and placing boundaries on it, environmental policy planners will be provided with an important tool for anticipating issues and gauging the utility of policies designed to meet them. The approach to the construction of alternative futures entails the projection of certain key trends over the next 25 years and estimating the social, economic, and political consequences of a varying combination of their impacts. This report contains the scenarios of the alternative futures, the policy conclusions drawn therefrom, and recommendations for the continuing use of the alternative futures method in the Environmental Protection Agency planning process. (Author/BB)

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ALTERNATIVE FUTURES FOR ENVIRONMENTAL POLICY PLANNING: 1975-2000

ENVIRONMENTAL PROTECTION AGENCY
Office of Pesticide Programs
Washington, D.C. 20460

October 1975

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ALTERNATIVE FUTURES FOR ENVIRONMENTAL POLICY PLANNING: 1975-2000

October 1975

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PREFACE

This report, Alternative Futures for Environmental Policy Planning, was prepared by the Center for the Study of Social Policy, Stanford Research Institute, for the Office of Pesticide Programs of the Environmental Protection Agency. The final report contains the scenarios of the alternative futures, the policy conclusions drawn therefrom, and recommendations for the continuing use of the alternative futures method in the EPA planning process. A second volume contains the informal working papers used in the development of the scenarios.

The report covers the next twenty-five years--1975 to 2000, essentially from the perspective of possible futures for the United States placed within a world context. By exploring the uncertainty of the near-term future and placing boundaries on it, the authors believe they have provided the environmental policy planner with an important tool for anticipating issues and gauging the utility of policies designed to meet them. The approach to the construction of the alternative futures entailed the projection of certain driving, or key, trends over the next twenty-five years and estimating the social, economic, and political consequences of a varying combination of their impacts. Certain key policy questions provided by EPA were placed in the context of these futures and conclusions were drawn therefrom.

Willis W. Harman, Director of the Center for the Study of Social Policy, was in overall charge of the study. David C. MacMichael, Project Leader; Duane Elgin; and Peter Schwartz; all of the Center, were the principal authors. Thomas Blue, Manager of Agrochemical Research, and Peter Stent, Agricultural Economist, provided the main technical, pesticide related inputs. Research Assistants David Gili, Michael Reynolds, and Elsie Garfield gave important assistance.

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I INTRODUCTION AND SUMMARY

This report explores a range of alternative futures covering the next twenty-five years. These concentrate on the United States but place this nation's future experience in a world context.

The last twenty-five years have seen enormous changes, both quantitative and qualitative, in American life. Whether or not the average American individually experienced anything like Alvin Toffler's Future Shock during these years can be argued, but it is clear that American society, having ingested all the changes it did in a generation, is now having severe problems in digesting them. The United States, in Donald Michael's phrase, was an "unprepared society" that found itself, to use Michael Harrington's words, in an "accidental century."

In looking at recent history and the problems now before us, the message that comes through most clearly is the great uncertainty with which we must view the future. For the person in the role of making long-range policy that uncertainty is indeed uncomfortable. This project was initiated by EPA not to eliminate uncertainty but to explore it; to help make policy, not in ignorance of the future, but in full cognizance of the dimensions of uncertainty. In that sense this study should be viewed as an exploratory venture, more of a heuristic than a predictive process, the results of which the policy planner can use as a guide for deliberation but which he can also use as a tool for the continuing creation and analysis of variants on the alternative futures presented herein.

Objective

The objective of this report is to provide EPA with a set of alternative futures forecasts for use in the planning of pesticide policy. Although, by direction of EPA, the forecasts are general in nature and are not focused specifically on pesticide-related matters, they are based on the projection of trends seen as most relevant to EPA and have been subjected to an analysis that emphasizes the constraints and opportunities for environmental protection and regulation in each of the futures.

The Approach

The general approach was to integrate perceptions of the future that the project team derived from its own analysis and an analysis of recent futures literature. The result of this procedure was a series of ten alternative future scenarios.

The study was carried out in four major stages briefly described as:

- Trend analysis--From a large candidate list of trend areas, eleven were selected for detailed study. These included such trend areas as climate, energy, food production, values, and social trends. In each case recent developments were analyzed and alternative forecasts were identified.
- Skeletal scenarios--Four from that set of trend areas--energy, climate, food, and social values--were selected as "driving" trends, meaning that the future is considered to be particularly sensitive to the direction of those trends. Brief outline scenarios were built up from analysis of the trends.
- Futures literature--A survey was made of the futures literature to identify sources that would cover a wide range of currently accepted views of the future and were relevant to the study. Each source selected was analyzed to identify its underlying assumptions and each was reduced to a brief summary. This analysis was then used to develop a list of dimensions across which the authors had developed their images of the future.

- Scenario expansion--Each of the skeletal scenarios was fleshed out using the inputs from the futures literature along such dichotomized dimensions as centralized versus decentralized government and industrial versus post-industrial economies. The result of this task was the creation of ten alternative future scenarios.

Alternative Futures

The ten alternative future scenarios are the heart of this report. They represent, with significant individual variations, three main themes of general outlines for the coming twenty-five years.

The first theme, industrial success (Scenarios 1, 6, 7), is that of relative success within the limits of the industrial age paradigm. Despite the difficulties experienced, the United States and world societies generally succeed in discovering, organizing, and using human and material resources to address political, social, and economic problems and to produce an economically viable and equitable environment that incorporates individual liberty and opportunity for self-fulfillment in some stable relationship with the biosphere. These results are achieved, albeit imperfectly, through the medium of the political, economic, and social forms now existing in the developed countries. No major value changes nor significant institutional changes are experienced, although former values and institutions, of course, evolve and are modified during the experience.

The second theme, industrial failure (Scenarios 2, 5, 8, 9),expresses the relative failure of these same institutions. Resources are either not found or prove inadequate in the face of mounting problems, and the problems themselves are exacerbated. Generally speaking, nations of the world become poorer, less equitable societies that provide less individual liberty and opportunity for self-fulfillment, and that exist in a less stable and decreasingly viable relationship with the natural environment. However, the major institutions and the industrial-age values they incorporate remain dominant. Neither alternative values nor reformed institutions develop. The industrial-age system functions but less efficiently and less happily.

The third theme, industrial transformation (Scenarios 3, 4, 10), is one in which the industrial-age paradigm, during the course of the next twenty-five years, is drastically changed and, in effect, transcended. The paradigm's potential for further success is outweighed by its inherent limitations. A new paradigm, exemplified by the adoption of so-called "frugal" values, incorporating the Buddhist economic principle of maximum personal satisfaction with minimum consumption or, in culturally more familiar terms, Emerson's ideal of "plain living and high thinking," emerges. Social and economic institutions are developed that are simpler and interdependent and that, reversing current trends, involve more people in self-sustaining activities. Despite the occurrence in some scenarios of considerable trauma during the period of transition, this is a successful theme. Individual satisfactions over all dimensions are generally high, and the new social and economic institutions incorporate the principles of harmony between human activity and the natural environment.

Policy Conclusions

Policy implications were derived by examining specific policy issues relevant to EPA/OPP in the context of each of the ten scenarios across three time frames (1980, 1990, and 2000). Summarized below are the general policy conclusions that emerged from this analysis:

- Scenarios--After inspecting the range of alternative future scenarios with respect to their overall favorability for fostering realization of EPA goals of environmental protection, we concluded that: In the short run (1975-1985) the realization of EPA goals will likely be significantly difficult; in the intermediate run (1985-1995) we anticipate a return to a more environmentally conscious society but one held back from the late 1960s levels of environmental "activism" by economic factors; and in the long run (circa 2000) we anticipate the emergence of strongly environmentalist attitudes supportive of EPA.

- Issues--After inspecting specific policy issues across all scenarios, we made a number of general policy inferences. One illustrative example is that: In the short run (1975-1985), across many (but not all) scenarios, there seems to be considerable tolerance for environmental degradation; in the long run (approaching 2000), this situation tends to change markedly as public attitudes become considerably less tolerant of degradation of the environment.

- Policy reversals--A "reversal" was defined as a clear and substantial change in policy direction from one time frame to the next within the context of a given scenario. The frequency and distribution of reversals across issues and scenarios were analyzed. This analysis revealed a substantial number of reversals, emerging across many scenarios and many issues, that imply a significant need for flexibility in policy formulation to cope effectively with these discontinuities.

- Policy-planning process--The plausibility of great social change, coupled with uncertainty as to the exact timing, nature, and dimensions of that change, suggests the need for an innovative policy-planning process that would acknowledge uncertainty, embrace error, engage in goal setting, foster first-hand experience in futures exploration, and engage in boundary-spanning thinking.

- Social change--By focusing concern on specific issues, the significance of social change revealed by the alternative future scenarios may be obscured and the perceived individual and institutional dimensions of its impact may be unduly narrowed. Our analysis suggests the plausibility--indeed the likelihood--of social change of major proportions that goes well beyond what one might infer from simply examining environmental policy implications. Because the forces that drive this major change are largely external to EPA (in that they are beyond EPA's control), for EPA's policymaking process to be responsive to their implications, planning must not only be policy specific but also contextual as policymakers examine the dynamics of change in society.

Conclusion

As a conclusion to this introduction we must reemphasize that this study is, and claims to be, no more than a methodical exploration of the uncertain. The ten future scenarios developed and the policy implications derived therefrom represent at most the considered judgments of the research team. Although the research team is convinced that the scenarios and the methodology used to produce them are valid, we reiterate that these views of the future are gained from the perspective of today, from analysis of the data available today.

The policy planner who employs the results of this study tomorrow, or next year, or five years hence must realize that the perspective will have changed, that more data will be available, that events will either confirm or render false certain of the trend projections on which the forecasts were based. The planner must revise and adapt the scenarios and the policies based on them in accordance with developing reality. Futures forecasting is a dynamic process to be incorporated within the planning system; it is not a rigid predictive device to lock the planner into either self-fulfilling prophecy or into programs incongruent with reality. The last section of this report offers suggestions on how EPA can revise these scenarios or write new ones as conditions change.

In other words, these alternative futures forecasts are slates written in chalk, not tablets graved on stone. Given that the tools of the planner are more likely to be blackboard and chalk than marble slab and chisel, we believe they are all the more useful for being presented in this form.

II FUTURES METHODOLOGY

The method by which the alternative futures were generated is complex. In the interest of brevity, only a summary description can be presented here. A more thorough description of the methodology is included in Volume II, Working Papers.

It is important that the reader of this report understand the context within which the methodology was developed. The research team was familiar with pitfalls of futures research and consequently had learned to be suspicious of:

- Personal biases--We consciously attempted to develop a methodology that would inject and force consideration of view points at odds with our own.
- A strict reliance on empirical analysis--In other words, we did not assume that "if it is not measurable, it is not meaningful." Rather, we explicitly attempted to include nonquantifiable dimensions. Whether one calls a nonquantifiable dimension an "intuitive element," "pattern recogniton," or "visceral understanding," we attempted to foster such dimensions of the analysis in addition to empirical dimensions.
- A reliance on a single methodology--Given the limitations of any single methodology, we attempted to integrate several methods in a way that intensified the strengths and lessened the weaknesses of each.
- The dogmatic application of a predetermined methodology--We viewed the methodology only as a guide for structuring thought, not as an imperative that eliminated the need for thinking. Although we had a detailed work plan, the research process evolved over the life of the project. When we encountered mistakes and blind alleys, we retreated and started again. It was an exploratory and learning process; both the methodology and the direction of our thinking evolved as we learned from our mistakes and our successess.

There were four major stages in our generation of alternative futures:

(1) Analysis of important trends

(2) Development of skeletal futures

(3) Review of futures literature

(4) Expansion of skeletal futures into detailed futures.

These stages are described in greater detail below.

Trend Analysis

We first reviewed a large number of potentially relevant trends. From that universe of trends we selected a subset that would include both general major societal trends (e.g., value changes, international societal trends) and trends that were clearly relevant to EPA (e.g., energy, food supply and demand, demand for pesticides). The purpose of this exercise was to acquire an overview and perspective of trend areas so that we could make informed judgments when constructing the alternative futures. Summaries of these analyses are given in the appendix in this volume, and the full trend analyses are contained in the Working Papers to the final report.

Development of Skeletal Futures

To begin the construction of alternative futures, we identified four critical trend areas and termed them "driving" trends: energy, climate, food, and values. Although we recognized that these do not constitute all the important trends, we felt that this trend cluster could roughly but usefully serve to approximate the state of other variables. We studied all potential interactions between driving trends to identify those that might plausibly occur within a time frame of 5, 15, and 25 years into the future. For example, a plausible interaction might be a situation where adverse climatological changes and chronic energy shortages create a situation of high food prices and short food supply that could lead to substantial value changes supporting a more frugal or simplified lifestyle. Although the number of possible trend interactions is enormous, the number of plausible interactions was sufficiently small to make the methodology workable. The end product of this phase of the research was a group of ten skeletal outlines of the future that lacked detail and richness of description. The next stage, review of futures literature, was needed for the fleshing-out process.

Review of Futures Literatures

To temper our own biases, we made a systematic review of the futures literature and tried to select views of the future that would express a wide range of views and assumptions and would be relevant to the concerns of EPA. We selected 16 descriptions of the future (ranging from a research report at SRI, published nonfiction works, and science fiction), and assessed them all in a common format (see the Working Papers). After systematically analyzing the assumptions various authors had made and reviewing the dimensions across which they had developed their descriptions of the future, we were able to develop a master list of dimensions across which we could begin to fill in the "flesh" of the future skeletons that we had developed earlier.

Expansion of Skeletal Futures into Detailed Alternative Futures

Details of the skeletal futures were then filled in by developing each future across the dimensions generated earlier (e.g., centralized versus decentralized government, industrial versus post-industrial society, valuing present generations versus future generations with other priorities), and by being mindful of the assumptions made by other authors about when and under what conditions the emergence of a

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future with these characteristics seemed plausible. This latter process was both structured and systematic but nonetheless was highly subjective. The full futures were then reviewed twice for consistency, congruence, comprehensiveness, and accuracy. The alternative future scenarios presented in Section III are the result of this four-stage methodology.

The Likelihood of Different Scenarios

The project team did not attempt to evaluate the relative probability or likelihood of the different scenarios for several reasons:

- EPA's objective in initiating this study was to explore uncertainty and not to define a most likely future.
- The future of an entire society is so uncertain and the forces determining the future so complex and subject to such varying interpretations that at best, only a personal, subjective judgment would have been possible.
- Even if we did make a probabilistic assessment of each scenario, the reader, as he should, will make his own judgments and act on that basis.
- Finally, we feel that this work should be a starting point for an on-going policy process; if we were to judge the futures in terms of likelihood, it would, in our view, short-circuit the policy process and may result in a premature acceptance of a particular view of the future.

Utility of the Futures Methodology

This methodology for constructing alternative futures is considered particularly appropriate and useful for the public policy planner who needs to take account of both the objective and subjective conditions operant in the society for which goals and programs are devised. It is systematic but not rigid; it is rational but allows for the play of intuition; it helps in the provision of answers but requires continual asking of questions. Above all, it is a methodology that allows planners and planning staffs themselves periodically to assess the manner in which trends are developing, to apply more recent data, and to reconstruct, with as much detail as is considered necessary, future scenarios.

III ALTERNATIVE FUTURE SCENARIOS

Each of the ten scenarios that follow should be considered as an alternative image of the future, to be read much like a history. A history of any period never covers all of the events that took place. It focuses instead on those major events, issues, and forces which shaped the period. These scenarios cover similar highlights and in fact have all been written in the past tense, from the point of view of a writer sitting just beyond the year 2000.

Selection and Content of the Scenarios

The scenarios should not be viewed as forecasts of what will probably occur. Rather they are an attempt to bound the uncertainty with respect to the future. Outside that boundary lie futures in which there is no mission for EPA or any successor agency. Such futures include nuclear holocaust, collapse of civilization, and absolute dictatorships. These events are "wild cards" of an extreme nature and are excluded from the analysis (see further discussion, p. 217). However, less traumatic "wild cards" (e.g., oil embargo, terrorist activities, etc.) are included.

Several key criteria were used in actually choosing the images presented in the scenarios. First was that they should be plausible: that is, given the assumptions about the direction of trends, would a reasonable person believe that this is a direction that society, as a whole, could take? Clearly this is largely a subjective judgment. However, we found considerable guidance in the futures literature which provides a sense of images in "good currency"--views of the future that through the seriousness with which they are considered by the academic, government, and business communities are given a sense of legitimacy and validity. The SRI authors did not always agree among themselves as to which images are most plausible. In an attempt to avoid undue bias, a diversity of images was relied on, including ones which do not fit the personal beliefs of the authors.

A second criterion was relevance: that is, would any particular scenario be useful in the policymaking process? Consultation with OPP provided valuable insight and perspective as to what would be the most relevant scenarios. In general, however, we felt that relevance would be assured if a diversity of images were presented, a variety of modes of change were included (e.g., continuous versus discontinuous), and the scenarios were sufficiently evocative to give a "feel" for the future. In this last sense it is important to note that the purpose of these scenarios is to provide a frame of reference for policymaking rather than policy conclusions.

The scenarios are organized into a number of component parts. The first page presents a title, summary, and the directions of the four "driving trends" of energy, values, climate, and food over the time period of 1975 to 2000 (the definitions for these driving trends is shown in Table 1). The graph on the first page of each scenario shows the distribution of the population among three "value clusters." The second section, "Driving Trends," describes the interactions of the four key trends noted above. "Individual Aspects" presents changes in the psychology and values of individuals. The fourth section, "Social Systems," presents a broad view of the changes in the nature of social institutions. "Productive Systems" discusses the development of two particular dimensions, the economy/industry and science and technology. The final section, "Ecosystems," covers the evolution of the physical environment and ecological values. With each section is a table of

Table 1

DEFINITIONS OF DRIVING TRENDS

Energy (E)

Continued high growth: the historical trend of high growth (rate = 4%) in energy consumption is continued.

Controlled growth: the growth rate in energy consumption is controlled by design and slowed (rate ≅ 1-3%).

Unsuccessful high growth: the continued high growth in energy consumption is disrupted by severe supply problems and a rapid net decline is experienced.

Zero or declining growth: the growth rate in energy consumption is leveled out (rate ≅ 0- -1%).

Climate (C)

Variable climate: from year to year the climate is relatively unpredictable, swinging from good to bad. In some years the weather conditions for agriculture are generally favorable. In others drought, untimely rain, or shortened growing seasons are experienced.

Favorable climate: the trend from 1890-1960 of generally constant, good, and predictable weather is resumed. From year to year the weather pattern aids expanding agricultural production.

Worsening: the trend from 1960-1970 of cooler weather and shifting, hence unpredictable weather, is continued. In most years droughts, untimely rain, shortened growing season, or other weather-related calamity is common.

Values (V)

Achievement values: this sector of the population emphasizes material things--status, fame, affluence, and outward achievement--on the personal level; and growth, bigness, competition on the system level. Other descriptions of values congruent with this sector include: mechanistic, materialistic, individualistic, secular, centralized, scientistic, emperical.

Survival values: this sector embraces the values of the achievement sector as described above; however, the material circumstances are such that these values cannot be readily realized. The consequences are frustration, dogged endurance, emphasis upon security and survival aspects of achievement values, etc.

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Table 1 (Continued)

Frugal values: emphasis in this group is upon voluntary simplification of the exterior aspects of life in order to attain greater richness of inner aspects. Coupled with the foregoing are two other dominant values: a self-realization ethnic which asserts that each person's proper goal is the evolutionary development of his fullest human potential; and an ecological ethic which asserts that the Earth is limited, recognizes the underlying unity of the human race, and perceives man as an integral part of the natural environment.

Survival/frugal split: this is a values pattern which emerges when the dominant achievement sector is substantially reduced to a small minority by adverse economic circumstances and leaves two divergent modes of responding; importantly, the nature of the response of these two groups is often nearly identical but the motivation (premised upon values) is often quite different; e.g., survival folks would consume less gasoline because they were forced to by high prices; frugal folks would consume less because they were forced to and because they wanted to consume less, given their values orientation.

Trimodal split (achievement, survival, frugal): this values grouping assumes that there is no single dominant values sector in society; rather, the values are split among the three groups.

Achievement/frugal split: the values are split predominantly among the two groups along the values dimensions as characterized for each above.

Achievement/survival split: the values are split predominantly between these two groupings along the dimensions described for them above.

Food (F)

High prices for food/no food shortage: a number of forces can combine to create a "high" price without a food shortage; e.g., higher energy prices, a moderate degree of adverse climatological change, export of food to enhance balance of payments, more food demanded due to population growth domestically and/or abroad, greater proportion of indirect consumption of protein, greater proportion of food consumed with technological input--so-called "convenience foods," and so on.

Table 1 (Concluded)

Moderate food price/no shortage: this condition assumes that the supply and demand factors discussed above do not individually or collectively "conspire" to create high prices and/or shortages.

High food price/food shortage: this assumes that some combination of adverse circumstances--domestic and/or international--creates a condition where there is both high food prices and chronic food shortages.

descriptors which provide in a schematic form the nature of change along a number of dimensions (the definitions of these can be found in the glossary). The last component in each scenario is a series of excerpts from our synopses of a variety of futures literature, intended to provide additional support for that scenario.

The Starting Point of the Scenarios

Although EPA specified that this study concentrate on the period from 1985 to 2000, we had to consider the ten years between now and 1985 as well, if for no other reason than to provide a context for consideration of what comes after.

The situation in the world today is one in which most national and world leaders came to maturity and developed their visions of the future in the context of the so-called long term multi-fold trend popularized by Herman Kahn and analyzed by such writers as Daniel Bell and Peter Drucker. Many of these leaders now find themselves being overtaken by events which they seem less and less able to control. For example, the world monetary system established at Bretton Woods no longer functions. The system of currency "float" which the present leaders accepted in 1971 has taken on the characteristics of aimless drift and eddy. The familiar distinction between developed and undeveloped nations no longer holds. The poor but resource-rich nations--particularly the oil-producing nations--successfully reversed the terms of trade and are now in a position to dictate new conditions for the relationship. These same nations, cutting loose from reliance on economic aid from the industrialized states, are using their sudden profits for internal development on a vast scale in programs of industrial investment and agricultural modernization that indicate the new situation will never revert to the old. Moreover, these nations might take the place of the industrial nations as the major providers of capital to the less fortunately endowed undeveloped nations, further upsetting the old developed-patron/undeveloped-client system.

Meanwhile, the politico-military failures of the United States in Southeast Asia and, to a lesser degree, in the Middle East and the Mediterranean combined with the implications of detente with the Soviet Union and the normalization of relations with China have called into question the political viability and rationale of the post-World War II system organized and headed by the United States. The setbacks seem to justify the arguments of revolutionaries that the United States is only a paper tiger. Detente and normalization of relations undercut the position of moderates and conservatives who defended their support for the United States in terms of the continuing and necessary struggle between good and evil theories of human existence. Not only has the United States, with all its power, fought and failed to win, but it apparently has lost its own belief in what ostensibly it had been fighting for.

Just as important, even though frequently overlooked, is the increasing lack of identification between the governments of the industrialized, free enterprise, democratic nations and important segments of business leadership within them. Multinational corporations, for so long seen as the spearheads and agents of developed nations for penetrating and controlling the third world, increasingly seek to maximize their own gains regardless of the effect of their actions on the policies of the governments of their home nations. Indeed, in the instance of the international oil companies, they on occasion appear to act in concert with the oil producing nations in which they operate instead of with the oil consuming nations in which they are chartered.

These radical changes in the world system in which the developed countries have operated during the past few decades are not, in themselves, necessarily bad. Possibly more opportunities for peace, for worldwide economic and social development, and for human growth have resulted than would have prevailed had the rigidities of the post-World War II order been maintained. On the other hand, the potential for mistakes and massive failures, possibly threatening peace and the relative prosperity which much of the world had achieved under that order, may also have increased.

The adverse potentials are underscored by the simultaneous, and not unrelated, economic recession that has gripped the developed and developing countries in recent times. The general optimism of ten or fifteen years ago about the ability of business enterprise in partnership with science, cushioned against failure by Keynesian government policies, to eliminate poverty without redistributing wealth has largely dissipated. There is a climate, or at least a strong hint, of fear that recession might deepen into depression on the scale of the 1930s. Adding another dimension to the fear is a new and widespread awareness that the raw materials and fuels required for the continuation, let alone the growth, of the existing industrial system are finite and that sources of some of them may be exhausted within the not remote future. Exacerbating this apprehensiveness is a growing belief in the possibility of food shortages, even famine, not just in India, China, or the Sahel, but even in the United States, the land of plenty. Business publications that scoffed at the purveyors of "bleak chic" just months ago now feature articles on corporate survival during coming decades of low or no growth.* Increasing numbers of American families, in a mood reminiscent of the atomic bomb shelter hysteria of 1962, are stockpiling stores of dried and canned foods against the possibility of crop failures.

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*See, for example, Business Week, April 14, 1975, p. 84 and p. 44 ff., or Peter Drucker, "Aftermath of a Go-Go Decade", Wall Street Journal, March 25, 1975, p. 10.

Complicating this view of resource scarcity is the as yet incompletely understood effect of high technology agriculture on the environment. More and more, an educated public is aware that even if fuels and raw materials are available, their processing may lead inevitably to an entropic state in which life itself becomes impossible. Hence, an influential school of thought, led by the Rumanian Nobel Prize winner, Georgesco Roegen, says that growth, far from being a requirement for survival, must be limited, or even halted, as the condition of survival.

Perhaps the most interesting feature of the present situation is the contrast between the passivity of the developed nations and the enthusiasm and drive that marks some of the more favored undeveloped countries. During the past few years of stagnation, of rising prices and unemployment, of diplomatic setbacks, of abuse of trust in the U.S. political system, there have been no large scale public disorders in the form of protest demonstrations, street riots, strikes, and so forth. Nothing remotely approaching the scale of the French student riots of 1968, the U.S. ghetto risings of the late 1960s, or the Vietnam War protests has appeared. Even normal politics seems not to have been enlivened. The Congressional elections of 1974, taking place in the emotionally supercharged atmosphere of Watergate, were met by widespread voter apathy. Whether the public, in the United States at least, is despondent and defeatist or, on the contrary, soberly determined to get through the situation in a rational, nondisruptive manner, is open to question. Beyond doubt is the absence of ebullient optimism.

The 1975 situation, then, is one of caution and reduced expectations in the developed, free-market industrial nations. While faith in the old leadership in government, in science, in business, organized labor, and education has clearly declined, no successor leadership calling for new programs or institutions has appeared. Indeed, most of the nascent movements for basic systemic change that were most visible and audible during the boom years of the 1960s--when the old system was enjoying its greatest apparent success and Great Society programs were expanding as rapidly as great corporation profits--have dwindled away. Partly this is because many change-oriented programs are embodied in official agencies (EPA being one), and partly because many of their leaders have moved into power positions within the regular system. Probably more important, though, is that these movements themselves were part of the general optimism of the 60s--the pervading sense that anything was possible. The revolution of reduced expectations has been as hard on counterculturists as on MBAs and aerospace engineers.

For the time being, at least in the developed countries, the tendency is to cling to established institutions, to traditional ways of doing things. Furthermore, the public mood seems to indicate willingness to accept sacrifice in the interest not so much of assuring greater returns and increased wealth in the years ahead but of preserving that which is. The implications of this willingness to conserve and retrench, with its overtones of wait and see and of giving the system and its leaders another chance, are reflected in the early years of many of the scenarios.

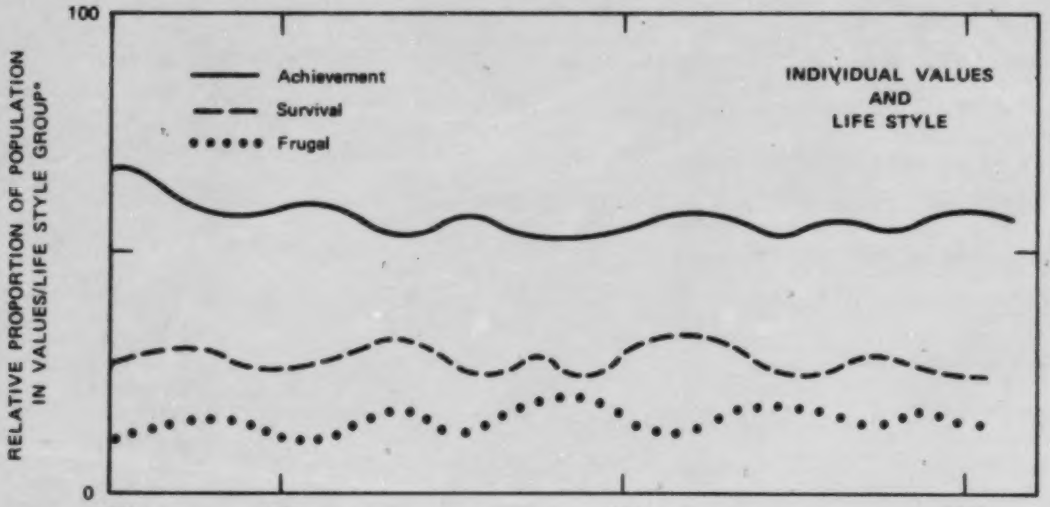
These futures are written from the perspective of the United States. Developments in the rest of the world are recognized, of course, particularly as they affect trends and developments in the United States. However, in all of the scenarios the United States is seen as self-determining. It responds to events elsewhere in the world, but these events do not by themselves determine the U.S. response.

SCENARIO 1

"HITTING THE JACKPOT"

Summary

Basically, this is the Kahnian future. Science produced the answers; nature was kind; wise corporate business leadership acted responsibly; government stayed out of the way. The present time of troubles was merely a temporary aberration on the long term multi-fold trend line. The general, increasing, and more widely extended level of prosperity during the 25-year period placed no excessive strain on the environment: the prosperity of the period enabled the repair of whatever minor damage was done. By 2000 the highly complex and interdependent world economic system demanded a form of world government, and this same system increasingly demanded and established world rules for regulation of the environment.



	1980	1990	2000
ENERGY	continued high growth	continued high growth	continued high growth
CLIMATE	favorable	favorable	favorable
FOOD	moderate price, no shortage	moderate price, no shortage	moderate price, no shortage

*The values/life style graph is not meant to be a precise description of population in each life style/values group; rather it is only intended to be illustrative of the changing pattern of life-styles and values.

Driving Trends

This is a highly continuous scenario. What change there is, is a product of success.

The problems of the mid-70s (e.g., energy shortage and recession) were temporary diversions from the long-term trend of continued U.S. success. The problems of energy were solved by a vigorous joint effort of the public and private sector, but led by the private. Concerted effort by the scientific and technological community brought down the technical barriers one by one.

The brief decline in climatic conditions through the 1960s was reversed and the longer trend--since 1890--of generally favorable weather continued. The combination of good climate and abundant, low cost energy allowed increasing production of food at a relatively low cost. Advances in agricultural technology in conjunction with the above developments staved off global starvation.

Individual Aspects

This was not a "dynamic" future with respect to value patterns--the basic values of the long term multi-fold trend predominated throughout the entire period. Consistent with the early economic difficulties was a relatively small and short term growth of the frugal/survival sectors of society but within the space of several years the "normal" value patterns reemerged. Additional short term aberrations or fluctuations of values could occur in this scenario but they would be small changes around a dominant value trend: rationalistic; requiring much adaptation of persons to systems dynamics; high intolerability threshold; substantial self-interest; conspicuous consumption; materialistic; individualistic; mechanistic; secular; pragmatic; competitive; value present generations; no need for a new image of man; Epoch A sustained; scientistic; concern for physical ecology.

SCENARIO 1

Individual Aspects*

1980 1990 2000

rationalistic ——————————————→
active ——————————————→
adaptive ——————————————→
self-interest ——————————————→
conspicuous consumption ——————————————→
materialistic ——————————————→
individualistic ——————————————→
mechanistic ——————————————→
secular ——————————————→
pragmatic ——————————————→
competitive ——————————————→
valuing present generations ——————————————→
adequate image of man ——————————————→
Epoch A ——————————————→
science response mode ——————————————→

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*Each of these descriptors is briefly defined in the Glossary, pp. 229-234.

The impetus for fundamental change was very slight: external circumstances offered no great force for social evolution; rather, the primary impetus was to further extend and explore the possibilities of the industrial state paradigm.

Social Systems

The United States and the other free-market industrial countries demonstrated the will, vigor, and capacity to meet the challenges posed by the near doubling of world population, pressure on natural resources, shifts in the global political balance, and the problems of economic development in the Third World. This material success had the effect of reinforcing existing social values in the West and bringing about their further acceptance elsewhere.

The process of urbanization continued. Rural populations declined even further from their already low levels in the West and, through a combination of drastically lowered birth rates and rural emigration, were reduced throughout the world. Vast investments in housing, sewage systems, and other public utilities, and the expansion of health, fire and police, and social welfare systems went far to solve the physical problems of the urban environment. Characteristic of the urbanization process was the development of numerous satellite cities which repeated, on a lesser scale, the apartment style of living that almost universally replaced the single home suburb, even in the United States.

The nuclear, single-generation family remained the norm in the West and in the modernizing sectors of the rest of the world. The much lower birth rate--partly a function of a much later formal marriage age--made child care and education a less pressing concern for society than the provision of health and welfare services for the burgeoning older-age groups. With high economic activity and less physically demanding jobs, it proved possible and desirable to raise the retirement age to 70. However, despite advances in geriatric medicine that allowed the very affluent in the more advanced countries to extend their lives greatly, more and more of the nonaffluent elderly chose to reject life-prolonging technology and even to accept forms of geriatric euthenasia as a socially acceptable means of terminating existence.

With fewer and fewer people in the advanced countries and in the modern sectors of the developing nations engaged directly in primary and secondary occupations, and with full employment ensured in the burgeoning service and quaternary sectors, a more or less sensate and hedonistic lifestyle became widespread. While the nuclear family remained the norm, permanence in the arrangement was expected only during the raising of the children. This, combined with the later marriage age, produced a society with large numbers of young and older "singles." For these, efficiency in living arrangements was a priority, contributing to the growth of apartment dwelling. Sociologists agreed that willingness of the elderly to depart life was at least partly a function of the loneliness of the unmarried elderly. Although groups of people organized into societies for specific purposes were a feature of the time, neither communal living experiments nor traditional communities were of much importance.

As great corporations became ever more dominant in the economy, their societal role expanded. The Japanese model of lifetime employment increasingly came to be the norm.

International relations--after a relatively stormy period in the early 1980s while the changes of the 1970s forced some adjustments--stabilized within a complex system of trade relationships in which the multinational corporations increasingly played the lead role. To a great extent, governments merely endorsed and enforced the terms of these arrangements after the fact. The state trading corporations of Eastern

SCENARIO 1

Social Systems

1980 1990 2000

pluralist/homogeneous world →

nation state →

rational →

internal homogeneity →

high consensus →

territorial/spaceship ethic →

rigid →

collectivist →

active →

responsive →

mature →

slow change →

easy change →

system continuity →

centralization →

technocratic ethic →

continuous →

Europe entered fully into this system, and only the Asian communist states remained aloof.

This world of 2000 produced a nearly homogenous global social system. Achiever values dominated, but since they were modified to fit the ends of the great corporations with individual success measured in terms of advancement in a bureaucratized career pattern within them (and lack of success produced no catastrophe under the lifetime employment system), the pace of achiever life was not so frantic as it was previously. Individuals in this atmosphere--despite the emphasis on personal comfort and instant hedonistic gratification, and the relaxation of family ties--felt secure enough to support those environmental goals that were basically aesthetic and comfort-enhancing and did not threaten the continuity of the economy.

Productive Systems

The problems of scarcity which underlie other images of the future were overcome in this scenario by the vigorous pursuit of basic science and advanced technology. Where old resources were exhausted, new ones were substituted. The supplies of some old resources were extended by advanced means of recovery. The success of the technologists in bringing about the continuance of affluence increased their credibility and power in society. By the year 2000 the dependence of the nation on their continued success placed them in the position of being a carefully treasured elite, almost a priesthood.

By and large, most of these technological advances came out of the laboratories of the private corporations and not the government. Thus the strength of the large, advanced technology companies grew. Having the R&D capacity, they were to meet the growing needs of the nation. As a result, their share of the economic pie continued to grow rapidly. The

SCENARIO 1

Productive Systems

1980 1990 2000

production for profit →

increasingly concentrated industry →

increasing corporate self-regulation →

industrial →

continued high GNP growth →

resource abundance →

differential income distribution →

slow population growth →

continued faith in science and technology →

need for technological development →

information base →

knowledge elite →

concentration of power in a relatively few corporate giants continued as a result.

Ecosystems

In this scenario, the older man-over-nature mind-set clearly remained intact. There was no sense of an inherent critical threshold, and consequently environmental action was not seen as urgent. Policy decisions continued to be evaluated with respect to their immediate consequences rather than their long term impact.

While this view remained constant over time despite some cyclical economic variations, there were some changes in environmental concern as a result of the fluctuations. When times were good and everything was working well, modest concessions were made to the environmentalists. However, when a crisis came, these concessions were quickly revoked or violated with the rationale that society could not afford much concern for the environment.

SCENARIO 1

Ecosystems

1980 1990 2000

man over nature →

critical threshold not recognized →

discrete view →

undifferentiated growth →

first order consequences →

minor fluctuating concern for environment →

resilient environment →

action less urgent →

From the Literature[*]

The combination of science and technology and skilled management will, if government acts only to express society's desires and needs for a protected environment, develop the appropriate ways and means for dealing with such environmental problems as may arise.

Peter Drucker, *The Age of Discontinuity: Guidelines to Our Changing Society*.

Major emphasis is on the present reality and continued growth of a world economy. This will continue unless interrupted by international class war resulting from failure to increase the productivity of poor nations.

Peter Drucker, *The Age of Discontinuity: Guidelines to Our Changing Society*.

A truly international, interdependent economy develops through the agency of the multinational corporations. The pace of development increases. As standards of consumption rise, nationalism and ideologies play less and less of a role and the gaps between living standards in "developed" and "lesser-developed" nations are less likely to be politicized and disruptive. Raw materials (particularly oil) are freely transferred and do not become weapons of international politics.

Herman Kahn and B. Bruce-Briggs, *Things to Come: Thinking About the 70s and 80s*.

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[*] It is important to note that these synopses are *not* direct quotations; rather, they are the project team's summary interpretation of important futures documents. Direct quotations from the sources are identified by single spacing.

An increased rate of highly organized scientific research and discovery in all fields will be typical of the period. The major problem is the establishment of linkages between business management and science for both the direction of the effort into areas of economic payoff and for recognition of those discoveries that have immediate economic application.

Peter Drucker, The Age of Discontinuity: Guidelines to Our Changing Society.

No major war or territorial struggles are seen during this period. The period of formation of new nation-states is about over. Chances are about equal for the consolidation of the less viable entities as for the splitting away of the more viable portions of inefficient or divided nation-states.

More and more the functions of international relations will be the establishment of appropriate rules for the free play of the private multinational corporations as they develop the "global marketplace" and provide the impetus for development within the poorer countries.

Peter Drucker, The Age of Discontinuity: Guidelines to Our Changing Society.

There is little to suggest that new forms of family organization or other interpersonal relationships will be important. However, since the key to this future is the management of large institutions, it seems that all manner of diverse forms that do not detract from the individual's institutional performance will be equally acceptable.

Peter Drucker, The Age of Discontinuity: Guidelines to Our Changing Society.

There are no widespread and major deviations from the accepted norms which are: Neo-materialistic (achievement-consumption oriented), Neo-epicurean (more oriented toward human relations than to advancement and high achievement materially), Neo-stoic (the good soldier/civil servant), and Neo-gentleman (the high income man of leisure).

Herman Kahn and B. Bruce-Briggs,
Things to Come: Thinking About
the 70s and 80s.

Availability of sufficient energy and raw material resources is assumed. Specifically denied is any real possibility that the petroleum producing countries will be able to block the European countries' or the United States' access to oil or that they will find it either to their economic or political interest to do so.

Herman Kahn and B. Bruce-Briggs,
Things to Come: Thinking About
the 70s and 80s.

There is absolutely no possibility of any mass food shortages during the period. The Green Revolution has solved the problem effectively. The major food and agriculture problem will be that of food surpluses.

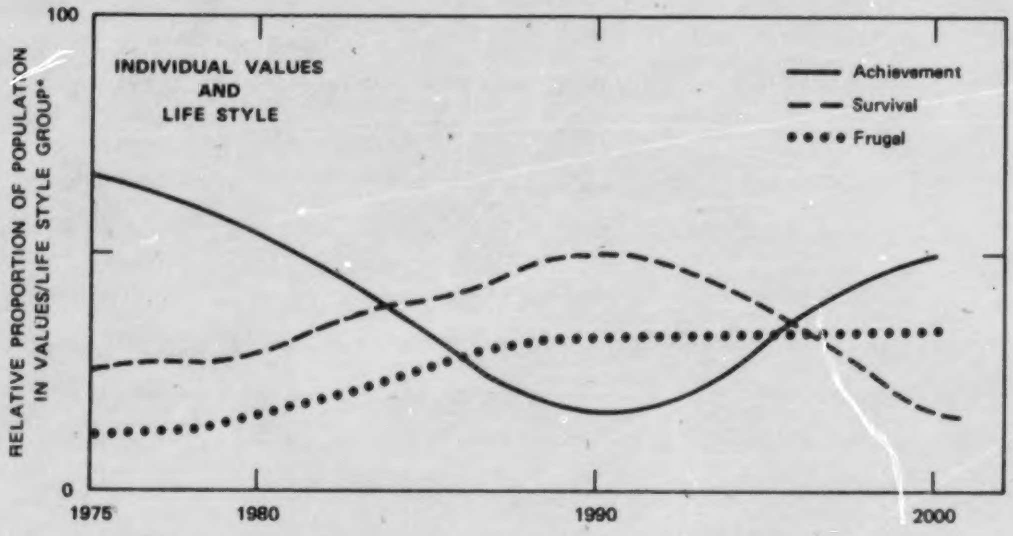
Herman Kahn and B. Bruce-Briggs,
Things to Come: Thinking About
the 70s and 80s.

SCENARIO 2

"NOT-SO-GREAT EXPECTATIONS"

Summary

Energy, climate, and food availability are the controlling variables in this scenario. Reduced availability of the first, worsening of the second, and a per capita decline in the third produce a depression situation by the mid-1980's. Major economic and social institutions in the industrial free market countries survive, however. A major factor in their survival is the emergence of a large minority of so-called "frugal" people who develop an alternative and supplementary economy and society which reduces the strain on traditional institutions. By the 1990's a societal adaptation is underway leading to economic recovery under less affluent but satisfactory conditions. The result by the early years of the next century is a more temperate, resource-conserving, environmentally-sound industrial system offering scope for the exercise of industrial age values on a reduced scale. Very importantly, despite the domestic turmoil that accompanies the transition period of the 1980's, no large scale international conflict or disharmony occurs.



	1980	1990	2000
ENERGY	continued high growth	unsuccessful high growth	controlled growth
CLIMATE	favorable	worsening	worsening
FOOD	moderate prices, no shortage	high prices, shortage	high prices, shortage

Driving Trends

Two major forces drive this scenario. The U.S. tried to continue its ever-growing consumption of energy but failed, and the climate steadily worsened. The energy conservation efforts in the late 1970s were unable to slow the rising consumption levels. By the mid-1980s the energy supply system began to deteriorate rapidly. Demand continued to grow, but nuclear reactors took longer to build than anticipated, coal gasification still cost too much, and the capital to expand coal production was very difficult to get. The complex, energy dependent, technological society nearly collapsed by 1990.

The energy problems were compounded by a worsening climate. The somewhat variable climate of the late 1970s took a dramatic turn for the worse in the early 1980s and continued unfavorable throughout the entire period. Growing seasons were shorter, rainfall patterns less predictable and less "on target." Such variable climatological patterns decreased crop yields both regionally and globally.

The interaction of these two factors made the food problem extremely critical. And, of course, as energy and food shortages grew in intensity and duration, and costs rose, ever-increasing numbers of people were driven down the economic ladder. By 1990 much of the population was living in poverty. Survival concerns dominated their lives. In that group many adjusted their aspirations and actively sought a more frugal way of life.

Over the next decade the application of varied energy technology (e.g., solar, wind, and biomass) allowed a modest degree of recovery. This was supported by a gradual adjustment of agricultural patterns to the new climatic situation. Thus, by the year 2000, while food shortages still persisted and more effort was required to support daily life, at least some of those who suffered in the collapse of the 1980s were climbing back up the economic ladder.

Individual Aspects

The future opened with the majority holding values consistent with the long term multi-fold trend--rationalistic, materialistic, individualistic, secular, mechanistic, utilitarian, pragmatic, and manipulative. These strongly held and historically successful values were increasingly undermined until by the mid-1980s the entire U.S. culture was in a state of both economic and value "shock." The industrial era values were retranslated into "industrial scarcity era" values: the society remained predominantly rationalistic, materialistic, and so on, but these values were applied to ensure physical survival in very turbulent times rather than to enhance discretionary consumption/acquisition.

A significant subculture emerged in this same time period. Persons who had been reading the Whole Earth Catalog and practicing backyard gardening for well over a decade were now forced by necessity to attempt to put to use the values and the practical skills they had been amassing. Necessity being the mother of invention, they were largely successful in inventing "new" lifestyles, values, and technologies appropriate for the "new scarcity." The values of this group were increasingly balanced between dimensions such as rational/intuitive, utilitarian/aesthetic, secular/spiritual, and manipulative/cooperative.

In the early 1990s, the success of the "frugal" sector seemed to indicate that this group might become the dominant segment of a society that was rapidly trying to sort out appropriate values and get on with the business of maintaining itself. However, the frugal sector did not gain political control as there ensued a period of fairly rapid economic recovery--though much below prior levels of activity. What became known as the "golden era" of material abundance provided a compelling image for those living in the "survival" segment. Consequently, the balance of values rapidly shifted in favor of the "modified achievement" sector of the population.

SCENARIO 2

Individual Aspects

1980	1990	2000
immature	adolescence	mature
conspicuous consumption	survival consumption	moderate consumption
rigid	flexible/adaptive*	flexible
rationalistic	anti-rationalistic	rationistic/intuitive
materialistic		materialistic/non-materialistic
industrial image of man	no guiding image of man/ humanistic image	modified industrial image of man
Epoch A	watershed	Epoch A
physical ecology	benign neglect	benign neglect/physical ecology
valuing present generations		
limits to growth unknown	limits known	below known limits

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*A bimodal split among descriptors is represtented by a slash--the first term of the pair being predominant.

The year 2000 arrived with the society badly split between two dominant groups, the achievement/survival and the frugal: the latter did not believe that the values and lifestyle of the former were appropriate or viable.

Social Systems

This scenario is marked by a high degree of emotional nationalism combined with a pragmatic acceptance of the need to accept some form of international order, no matter how imperfect, that would prevent the wars no one could afford to wage and which, it was understood, would result in even further economic breakdown. For this reason, the multinational corporations continued to be essential in keeping the creaking world economic system from collapsing altogether.

The early 1980s was a time of very rapid change as the enormity of the failure of the economic policy of the late 1970s struck home. In all the countries experiencing the changes for the worse associated with this scenario, there was much irrational social behavior. During the 1980s particularly, crime, family breakdown, alcoholism, narcotics abuse, bizarre religiosity, and suicide became more and more common. Stability and rationality were associated with those who adopted the frugal values and, in the 1990s, with the reemerging achievers. The directors of the failing society of the 1980s, although themselves demoralized, were rational in their determination not to resort to war. The 1980-1990 decade was one in which everything malfunctioned--even the weather. Power outages, transportation breakdowns, crop failures, and shortages of raw materials and spare parts were characteristic of the economy. Those choosing the survival ethic responded by ripping off and ripping down--squatting in abandoned buildings, begging, pilfering, and ultimately accepting the barest conditions of survival as enough. The frugals responded by organizing modest productive activities, community services, repair and maintenance programs, in order to supplement or replace what the traditional governmental or economic institutions could no longer deliver with regularity. After 1990 there was gradual improvement. Demands on the system were no longer so great, nor expectations so high. The sense of independence and the means for independence from the system were greater and more developed. Hence the complex and nearly automatic production and delivery means characteristic of the pre-1980 period fell into disuse. The simpler, less automated system did not function with as great speed or efficiency--but it broke down less frequently and was more easily restored when it did.

The technocratic ethic of complexity and highly specialized knowledge diminished throughout the whole period. Intermediate technology, Yankee ingenuity, repair and make-do became characteristic of both the frugals and the reemerging achievers. From the mid-1980s to the end of the period of stagnation characteristic of the times produced, even in the midst of the pervading pessimism, a sense of calm and continuity, of gradual change for better or for only slightly worse.

There was throughout a consensus on the need to avoid worsening the situation by war or revolution. Obviously, the survivors and the frugals tolerated but largely ignored each other except when frugals had to protect themselves from survivor marauding. By the end of the period the new achievers and the frugals clashed increasingly over the reorganization of the society and its direction.

The lifeboat ethic became prevalent among all major groups. There was little production of surplus. Even the frugals did not consider themselves obliged to take care of those who would not take care of themselves. Both the new achievers and the continuing body of directors who had kept the system (mal)functioning during the darkest days of the 1980s aided the survivors only out of the need for self-protection, and as a supplement to the use of police force.

SCENARIO 2

Social Systems

1980	1990	2000
pluralist/homogeneous	pluralist	
nation-state	regionalism	nation-state
rational	non-rational	rational
homogeneity	heterogeneity	
high consensus	low consensus	moderate consensus
territorial/spaceship ethic	lifeboat ethic	lifeboat ethic
rigid	adaptive	rigid/adaptive
individualistic/collectivist		collectivist/individualistic
active/passive		active
complacent/responsive		responsive
mature/immature		maturing
slow change		
system continuity	malfunction	malfunction/continuity
decentralization		decentralization/ centralization
technocratic ethic	technocratic/humanistic	
continuous	discontinuous	continuous

Productive Systems

During the 25 year period the boundary between the largest corporations and federal government became increasingly blurred. By the year 2000 control lay largely in what can best be described as a capitalist, corporate oligopoly. The trend toward increased economic concentration and close government/corporate ties was accelerated by the traumatic events of the mid-80s and early 90s. As energy became increasingly scarce and expensive, the largest corporations were in the best position to survive the storm. In addition to their own considerable power as the major source of jobs, governmental support (modeled on the Lockheed and Penn Central bailout of the 1970s) was designed primarily for them. Most of the populace acknowledged the necessity of this policy.

Despite difficulties the GNP continued to grow from 1975 until the early 1980s. Then the combination of energy scarcity and continuing poor weather drove the GNP down rapidly, nearly halving the record level of the early 1980s. By 1990 the situation stabilized (but at a lower level than had existed before 1980), and in that year the nation began to experience a very slow growth, with a GNP rising about 1 percent annually.

The 1980s saw a very significant leveling of income, downwards. With productivity and output severely limited there was little public tolerance for the high salary differentials of earlier decades. By the year 2000, with the modest recovery, the income spread began to widen slightly.

Many of the leading scientists of the 1970s had promised that new technology would deal with problems of dwindling fossil fuel resources. The promise was not fulfilled. As a result, faith in science and technology declined sharply. Research continued but not at the level of support of earlier years. Many of the significant innovations developed by the year 2000 were the work of backyard inventors. The hard times led, quite naturally, to a great variety of small scale inventions.

SCENARIO 2

Productive Systems

1980		1990		2000
corporate self-regulation	→	government regulation	→	quasi-nationalization
high GNP growth	→	negative GNP growth	→	very slow GNP growth
increasing economic concentration	→		→	
high faith in science and technology	→	diminished faith in science and technology	→	the backyard inventor
population dispersion	→	high population concentration	→	slight dispersion
rising agribusiness	→	stable agribusiness	→	rising agribusiness

The trauma of the 1980s reversed the flow of population out of the cities. Many small and medium sized towns, unable to obtain energy, simply vanished, their citizens heading for the larger urban areas where the major assistance programs were aimed. In the year 2000 the trend was again away from the cities but only very slowly.

Agriculture became even more concentrated in very large agribusiness. However, a significant portion of the population, having adopted a more frugal way of life, began in some measure to feed itself. Backyard farmers and chicken raisers bartered with each other. While not visibly part of the agricultural economy they became increasingly essential to its viability.

Ecosystems

By the year 2000 three divergent viewpoints emerged with respect to man's relationship with natural systems: the shaken but unchanged technocratic elite (achievers); the concerned but frustrated system supporters (survivors); and the concerned reformists (frugals).

The differences began to develop in the troubled period of the 1980s. The previously dominant viewpoint, that nature was immensely resilient and afforded ample time for man's technology to correct problems, withered in the face of the nearly disastrous energy/weather crunch of the 1980s. While the power elite refused to acknowledge publicly the gravity of that situation, the rest of society became painfully aware of how close they were to disaster.

The differences between these groups were clearly manifest in their basic concept of the relation between man and nature. The political and industrial leaders held the view that nature provided the raw material--although sometimes unwillingly--from which man was to rebuild industrial society. Others, however, saw man and nature as equal, interdependent

SCENARIO 2

Ecosystems

1980	1990	2000
no critical threshold realized →	sudden realization of the threshold →	growing acceptance of the threshold
growing environmental concern →	no concern →	limited concern
man over nature →	man vs. nature →	man equal to nature (frugals and survivors)
discrete view →	beginning systems view →	systems
resilient environment →	fragile →	

partners in a joint venture. While systemic, holistic thinking began to spread among both factions of society, it was the frugal group which progressed furthest toward assimilating the idea into its basic philosophy. The policymakers still viewed the dynamics of systems interaction as a means to a different end.

Among the people who experienced the shift in values from the "pioneer" ethic of the 1980s to the "spaceship earth" ethic of the new century, there existed yet another fundamental difference. While some people saw society heading down the same road that led to its near collapse, they felt powerless to change events and benignly supported the existing institutions and power structure. Their concern for the environment came second to their drive to survive--a drive which was strongly reinforced in the decade following the near collapse. Others, however, became totally committed to a lifestyle which supported the spaceship ethic and, while not always successful, worked to build what they believed to be a proper relationship between man and the ecosystems.

From the Literature

The changing value structure which is fundamental to this scenario has affected the U.S. economy primarily through the rejection of the old "economic growth" philosophy of management. The new "dynamically stagnant" economy is more service oriented and has adopted new measures of performance which stress quality of life rather than national product. Most people live an economically decent life with a declining interest in raising their material standard of living.

Pacific House Associates, An Organized Look at the Future.

The multinational corporations have become government unto themselves, acting without concern for national interests. There is ever increasing tension as a result of the continuing scramble for a diminishing resource base. The great corporate giants are those whose product is knowledge, information and technology (as ITT, IBM, and Xerox today). Using their considerable power, they are consciously manipulating global development for their own benefit.

John Brunner, The Sheep Look Up.

General energy and resource shortages, blackouts and system failures characterize the period. Efforts to solve the shortages of energy and other resources include the widespread utilization of virtually every technically and economically feasible method of resource recovery--strip mining, oil sand recovery, enriched uranium and plutonium breeder reactors, pit-fired steam generation, and coal mining and petroleum recovery in Antarctica.

Philip Wylie, The End of the Dream.

Following the Vietnam war the United States continued unsuccessfully to use its military strength to intervene in internal wars of liberation. The growing struggle for limited resources and the U.S. use of food as a weapon in that struggle exacerbates world tensions. The United States perceives itself to be beleagured and with few friends in a hostile world. The third world views it as imperialist and a voracious consumer of world resources.

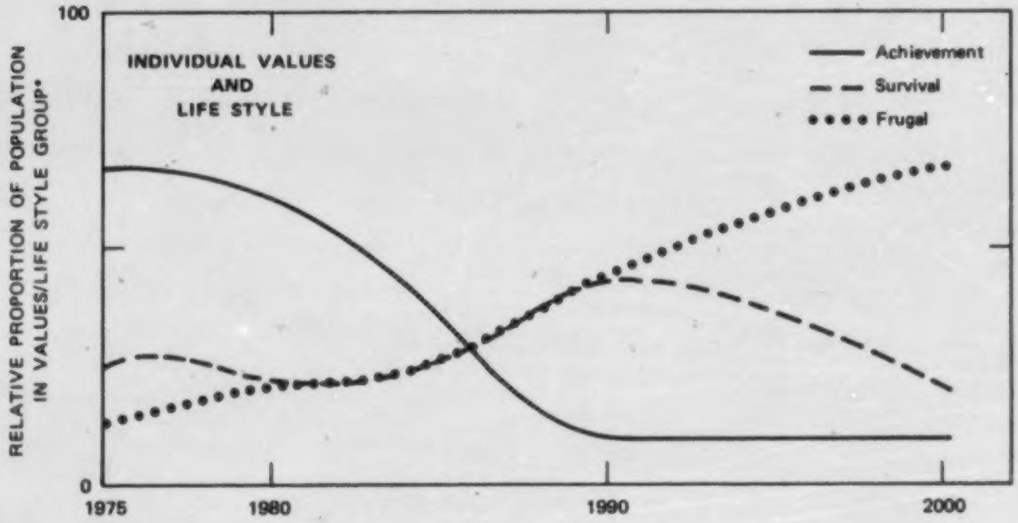
John Brunner, The Sheep Look Up.

SCENARIO 3

"APOCALYPTIC TRANSFORMATION"

Summary

The belief in unbreakable links among economic growth, energy, and affluence led the United States to bet its future on new technology making new resources available to sustain growth. By the mid-1980's the nation lost its bet, with the result that the economy nearly collapsed. The problems of the late 1980's were made worse by deteriorating climate. By 1990, however, a new ethic based on a more frugal way of life gained strength and grew very rapidly throughout the 1990's as people saw this group making do quite well in the face of adversity. By the year 2000 the "frugals" were in the majority and the United States had been transformed.



	1980	1990	2000
ENERGY	continued high growth	unsuccessful high growth	zero or declining growth
CLIMATE	favorable	worsening	variable
FOOD	moderate price, no shortage	high price shortage	high price, no shortage

Driving Trends

This scenario is the story of the near collapse of U.S. society and its dramatic restructuring into a new social order. In the late 70s and early 80s the United States tried to resume its historical pattern of continued high growth and rising affluence, and for a short time it succeeded. However, in the mid-80s two events shattered those aspirations. First was the "energy bust," as it came to be known. The new technology and resources failed to emerge quickly enough to sustain high consumption levels. This was soon exacerbated by a worsening climate. The complex, energy dependent, technological society fragmented rapidly and painfully.

By 1990 the combination of food and energy shortages meant that most people in the United States were just barely getting by. However, among those millions were a large number who seemed to be more adept than the rest, having earlier sought a more frugal way of life. As their relative success became apparent their numbers grew, until by 2000 they were the large majority. Both by necessity and intent, as they led the slow recovery from near collapse, limits were placed on the consumption of energy. A few good years in among the bad allowed an improvement in the food situation. Thus, by the year 2000, the outlook was at least hopeful.

Individual Aspects

The United States had approached the bend of the sigmoid curve too rapidly and unknowingly, and was unable to negotiate the transition successfully. The 1980s were truly a "watershed" decade as the values of the late industrial era were virtually wiped out. The struggle for survival which characterized the 1980s had a different tenor, reflecting the existence of a disorganized but usable and broad spectrum of technology and knowledge. The problem was that of entrusting power and scarce resources to the group which could best utilize the remaining industrial capability

SCENARIO 3

Individual Aspects

1980	1990	2000
rationalistic	instinctive	intuitive/rationalistic
rigid	highly adaptive	adaptive
passive	highly active	→
self-interest		increasing social consciousness
conspicuous consumption	maintenance consumption	increasingly frugal consumption
immature	increasingly mature	→
materialistic		materialistic/ non-materialistic balance
pragmatic		pragmatic/idealistic
secular	secular/spiritual	→
competitive	competitive/cooperative	→
valuing present generations		valuing present/ future generations
little need for new image of man	new image of man rapidly emerging	→
Epoch A	watershed	Epoch B
ambivalence for ecology		physical/taoistic ecology
science response mode	instinct/science	science/wisdom
anticipatory action		→
cyclical		evolutionary

to reconstitute a viable socioeconomic order as quickly as possible for the masses of people. The traditional industrial paradigm--premised upon abundant resources and a search for affluence--was clearly inappropriate for this new social venture; therefore, the society turned increasingly to the frugal sector--the small but successful group which was thriving amidst the adversity of the majority.

By the 1990s the frugal sector was beginning to capture the minds and hearts of an increasing proportion of the population. The instinctive struggle for subsistence of the 1980s was gradually replaced with a blending of intuitive/rational, pragmatic/idealistic values that allowed for the development and diffusion of a broad range of "intermediate technology" and supportive social forms. A new image of man which provided a magnetic pull for society also emerged forcefully in the 1990s: two interrelated "ethics" characterized this image--a self-realization ethic and an ecological ethic. By the year 2000, this image of man and a corresponding social form was firmly in place.

Social Systems

America marked its Bicentennial Celebration with a determination to take the traumatic events of the first half of the 1970s in stride. It declared it would resume its leadership of the free world nations. Prophecies of gloom were not to be heeded. The economy was to be kept going and the high consumption lifestyle maintained. In the meantime, the effort to discover new energy sources, funded substantially through federal deficit financing, would, it was believed, make Project Independence a reality within ten years. There was a burst of enthusiasm and an amazing display of national unanimity and international comity.

Within five years the dream was shattered. The nuclear energy program had to be abandoned after a series of disasters related to nuclear waste disposal and one spectacular catastrophe resulting in tens of thousands of deaths in an accidental Hiroshima. Likewise, a discouraging string of offshore oilspills on the U.S. East Coast combined with an OPEC policy of restricting exports of oil in the interest of maintaining reserves for burgeoning industry in the Middle East and Latin America brought about an energy bust that coincided with the beginning of several years of disastrous weather.

Industry in the United States and older developed countries nearly collapsed. Food shortages and utility breakdowns brought about near social collapse as well. The frustrations erupted into armed quarrels among old enemies and erstwhile friends in a dog-eat-dog competition for access to oil, food, and raw materials.

Fortunately, despite the use of tactical nuclear weapons in these struggles, the ultimate holocaust was not unleashed. However, the international order was shattered. Within the United States and elsewhere central authority became weak and ineffectual, and the period of near anarchy extended into the 90s. Individual states and regions became the foci of both political loyalties and economic activity. In climatically and resource-favored regions more or less self-sustaining frugal economies emerged in an atmosphere of competition and sometimes conflicted with the declining achievement-survivor system. There was little that seemed ethical or humane in the struggle. The great cities and their populations especially suffered.

The major social systemic characteristics of this future for the most part can be described as a desperate clinging to traditional forms even in the face of their inadequacy. The traditional family assumed greater importance in the face of the inability of government agencies to provide services. Both the marriage rate and the birth rate declined markedly, however, and even after marriage, children tended to live with their parents to share increasingly scarce housing, to pool income, and to give other support.

During the 1980s, democracy, both as a social expression and a political ideal, declined. Even as government became less effective it became more authoritarian and arbitrary. Industrial management, although also less effectual and productive, became more and more hierarchical. Private property rights were jealously guarded, especially in the United States. Elsewhere in the world the trend toward state capitalism and nationalization of enterprise became the rule.

The condition of the survivor sector was so bad that by the early 1990s more than a third of the U.S. population characterized by survival values had just about lost social coherence. The worst features of the so-called culture of poverty--family breakdown, mass criminality, drug addiction, alcoholism--were epidemic in this sector. One of the most demanding tasks of the new society emerging by the end of this scenario was the rehabilitation and reintegration of this demoralized group into productive life.

By the end of the century the situation was one in which the frugal ethic and lifestyle had come to dominate. The inflated expectations that had marked the beginning of the era had been abandoned. The frustration, with its violence and irrationality, that had marked the 1980s had given way to a determination to make the best of things. While the ideal of one world, of spaceship Earth, now seemed unattainable the widely shared frugal ethic did allow for the lifeboats to take more people on board and to move in a sort of convoy. While not actively supporting one another, they at least agreed that no actions really harmful to another's interests would be undertaken.

SCENARIO 3

Social Systems

1980	1990	2000
homogeneous world	pluralist	→
international order	nation-state	→
rational	irrational	rational/intuitive
internal homogeneity	heterogeneity	homogeneity
high consensus	extremely low consensus	growing consensus
territorial ethic	lifeboat ethic	spaceship ethic
rigid	shattered	transformed
collectivist	individualistic	collective individualism
active	passive	active
immature	→	mature
rapid, hard change	→	→
system continuity	collapse	new start
decentralization	→	regionalism
technocratic ethic	no dominant ethic	humanistic ethic
discontinuous	→	→

The end-state showed a world that had survived the destruction of the old industrial system and all the shocks that 25 years could produce. There was a sense of calm and maturity, of making a new beginning.

Productive Systems

In a little more than two decades the U.S. economy and industry underwent a profound transformation. The easy availability of oil in 1975 convinced most people that the energy crisis was fiction. Certainly the problem would have to be faced eventually, but by then new technology would come through. Thus through the early 80s the U.S. economy boomed, fed in part by huge exports of industrial and agricultural goods and technology to the OPEC nations. But later in the 80s the bubble dissolved. The process was not instantaneous; rather it took place over several years and was made up of a series of individual events, each of which unravelled some of the tautly woven web of U.S. energy system. Several minor nuclear accidents led to the extended shutdown of many reactors. Two supertankers collided off the New Jersey shore, wiping out the Jersey and Long Island beaches and leading to a temporary halt in the supertanker shipments into the northeast. A host of similar calamities plagued the system. Shortages, brownouts, blackouts, rising prices all followed. Energy dependent industry, including agribusiness, followed the energy system down. The bankruptcy of the biggest automakers in 1988 marked the watershed.

In the earlier years government had backed away from its regulatory role in order to let industry lead the recovery from recession. As the economy began to collapse the government increasingly stepped back in, less to regulate and more to save the productive capacity. Transportation, communications, and basic industries moved into public hands but at the regional, not national, level. The precedent for this had been set in the creation of the Northeast Railroad Corporation in 1975. Over the final decade of the century the slow recovery of the nation was lead by

SCENARIO 3

Productive Systems

1980	1990	2000
production for profit	minimal production	production for use
concentrated industry	fragmented	
corporate self-regulation	government regulation	self-regulation
industrial		non-industrial
high GNP growth	negative	dynamic equilibrium
differential income distribution	equalizing	
resource abundance	scarcity	sufficiency
slow population growth		stabilizing
continued faith in science and technology	diminished faith in science and technology	new science
need for new technology	ineffective use of existing technology	effective use of alternative technology
information base		wisdom/information
systems viable	nonviable	new institutions
globalization		nationalization
knowledge elite		knowledge mass

the new private sector. Rather than bigness, as small as possible was the rule. Rather than profit, utility became the measure of success. Rather than competition, cooperation was the guiding principle.

During this same period science and technology experienced an equally significant change. Most people had pinned their hopes on the technological might of the United States. When that hope failed to be realized in time, people lost faith in the worth of the expensive science and technology establishment. Instead they saw the backyard inventors as alternative organizations to produce technology appropriate to the new realities. Moreover, it was a technology that the average person could understand and tinker with.

Ecosystems

This scenario depicts a society whose attitude toward nature is transformed after the collapse of the mid-80s. As the high growth society of the 1970s ran head-on into high priced energy and a worsening climate, the values advocated by the frugal sector began to have a greater appeal. By the early 1990s it became apparent that to hold to the old values meant disaster, but there was hope in the "man in nature" ethic of the frugals whose lives seemed least disrupted during this period of travail.

The previously held point of view that proclaimed man's supremacy over nature began to erode into an open confrontation with nature in which it appeared man was losing. In the very desperate period of the 80s the previously won environmental gains were openly ignored as a sense of self-preservation prevailed. These violations of the environment would surely have proved dangerous had they continued; however, a combination of failures by the desperate old order and an enduring frugal sector soon shifted the emphasis toward the new paradigm.

SCENARIO 3

Ecosystems

1980	1990	2000
man over nature	nature over man	man in nature
critical threshold not realized	critical threshold suddenly realized	critical threshold guarded against
little or no environmental concern	concern abandoned for self-preservation	environmental preservation
resilient environment	fragility realized	fragility appreciated
discrete view		systems view
undifferentiated growth		differentiated growth
first order consequences		multiple order consequences
action less urgent		action urgent

This shift began with the immediate preservation of the environment as a matter of survival and grew to an extended world view which recognized the need for differentiated growth and the systemic nature of physical and environmental relationships. Society in the year 2000 was well aware of the fragility of the environment and the existence of a critical threshold, and it acted to prevent a return to a critical point in the future.

From the Literature

> ...as long as...population and industrial growth continue to generate more people and a higher resource demand per capita, the system is being pushed toward its limit--the depletion of the earth's nonrenewable resources.

Meadows, Meadows, Randers and Behrens,
The Limits to Growth.

The growing struggle for limited resources and the U.S. use of food as a weapon in that struggle exacerbates world tensions. The Cold War between East and West persists.

John Brunner,
The Sheep Look Up.

The ever growing demand for a shrinking supply of resources is a critical issue. This issue is a major source of international tension. It is also a key factor in the continued deterioration of the biosphere. Environmental quality yields to economic necessity. All resources available for development are extracted with almost no attention paid to the environmental costs.

John Brunner,
The Sheep Look Up.

The nature of the relationships between the various parts of the emerging world system is presented in terms of competition for resources--materials, energy, food, land, water and air. If these resources were unlimited there would be a chance to avoid conflict. The resources, however, are not unlimited. Therefore, the question is not: "Will there be conflict?", but "How will that conflict be resolved?".

M. Mesarovic and E. Pestel,
Mankind at the Turning Point.

The "scientific paradigm" is unduly limiting and does not allow for the development of a new image of man congruent with the future.

Center for the Study of Social Policy,
Changing Images of Man, Stanford
Research Institute.

The U.S. economy is expected to increasingly confront the problem of "limits to growth" and the impediments engendered by the behavioral properties of large complex systems which tend toward conditions of low performance.

Center for the Study of Social Policy,
Changing Images of Man, Stanford
Research Institute.

The recognition of shared, global problems really does little to foster international solidarity, cooperative planning, or equitable resource distribution. Despite the multitude of global threats, the world citizenry is divided by their adherence to anachronistic concepts of national boundaries and political ideologies. East and West are still fundamentally divided.

Philip Wylie,
The End of the Dream.

The economic system and other systems and institutions of modern technological society are incapable of existing within the limits of the earth's ecosystem.

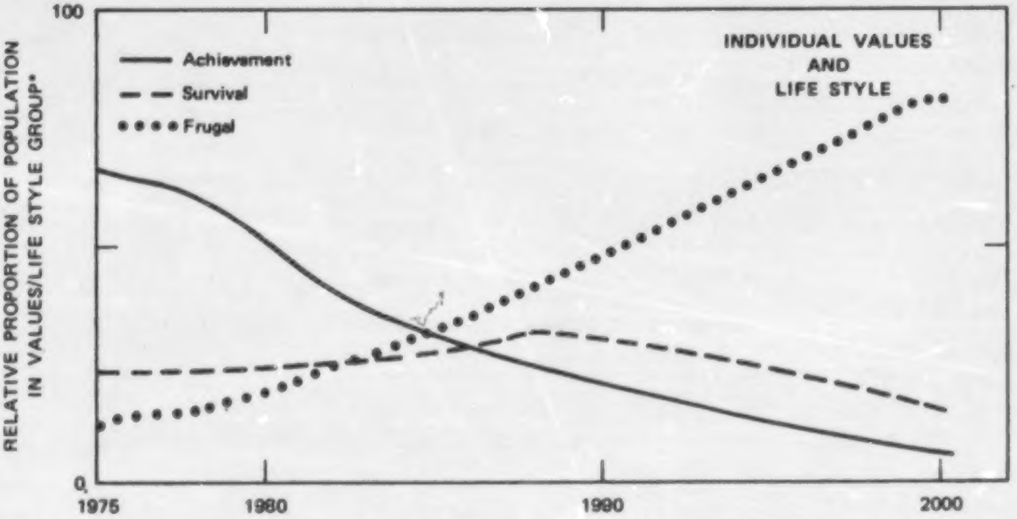
Philip Wylie,
The End of the Dream.

SCENARIO 4

"JOURNEY TO TRANSCENDENCE"

Summary

This scenario is the story of evolution and transformation. The old, growth-dependent order slowly eroded as it faced the limitations of a finite earth. From the late 1970's to the early 1990's the leadership doggedly persisted in trying to make the "American Dream" work but with diminishing success. A new order, guided by a more humane image of man, slowly emerged in the midst of the decay of the old. With ever increasing success its adherents learned how to translate its aspirations into practical realities. At the turn of the century the visible success of this new frugal sector had drawn most of the remnants of the old order to its side.



	1980	1990	2000
ENERGY	controlled growth	controlled growth	zero or declining growth
CLIMATE	variable	variable	variable
FOOD	high price, no shortage	high price, shortage	high price, no shortage

Driving Trends

Even in the late 1970s there was a recognition that unbounded growth could not continue forever. However, how that growth should be managed was a source of much dispute. Thus, the progress toward controlled growth without serious negative consequences was only slight before 1980. The management problem was worsened by an unpredictable climate. The U.S. economy suffered throughout this period as the unemployment rolls continued to rise and inflation drove prices higher and higher.

The next decade, the 1980s, saw little improvement in the situation. Growth was indeed slowed, but not without a price. The standard of living crept downward each year. The poor climatic conditions often meant temporary food shortages. However, one hopeful trend was the slowly growing number of people who were learning to live creatively with new realities. In both urban and rural settings they learned how to manage better for themselves; they placed less of a drain on the system. For the rest of the nation, no one called it a depression or even a recession. Things somehow just didn't seem to work right. Few were starving, but equally few were happy or hopeful about the future.

In the 1990s the obviousness of limited world resources and years of just getting by drove more and more people toward the frugal ideal. In and around the old order a new one had begun to arise. The message of its ability to make life not only pleasant but satisfying was increasingly visible to those who found little satisfaction in the dogged perserverence at making the "American Dream" a reality. By the year 2000 most Americans were learning how to live within the earth's means.

Individual Aspects

This future constitutes an evolutionary, humanistic transformation of society. The "frugal/unfolding" sector successfully propounded a new

SCENARIO 4

Individual Aspects

1980	1990	2000
rationalistic	intuitive/instinctive	rationalistic/intuitive
rigid	highly adaptive	→
self interest	→	self/social interest
conspicuous consumption	survival/frugal consumption	frugal consumption
immature	adolescent	mature
materialistic	materialistic/non-materialistic	non-materialistic
secular	secular/spiritual	spiritual/secular
pragmatic	pragmatic/idealistic	→
competitive	competitive/cooperative	cooperative
industrial image of man	post-industrial image of man	→
valuing present generations	→	valuing present/ future generations
Epoch A	watershed	Epoch B
science response mode	science/wisdom	→
little ecological concern	→	physical/taoistic ecology

image of man that was so compelling and magnetic that it pulled the disoriented achievement and survival sectors along an evolutionary path of social transformation with a minimal amount of disruption. Recognizing that the outer world reflects our inner condition, the frugal sector in its dissatisfaction with the exterior world embarked upon an intensive exploration of interior human growth and experimented with corresponding social forms. Thus the counterculture of the 1960s became a significant subculture in the 1980s and achieved dominant cultural status in the late 1990s.

A primary theme of social change was the voluntary simplification of external/material aspects of life in order to secure greater abundance in the internal/spiritual aspects of life. Individuals organized their lives deliberately to achieve outward simplicity by discarding possessions, activities, and institutions which were peripheral to the main purpose of exploring, in community with others, the further reaches of the human potential. As the inner condition of a substantial subculture evolved, the outer expression in new social forms reached a critical mass in the early 1990s and rapidly diffused throughout society. In retrospect, it seems that the driving force was not the need to respond to external problems; rather, the driving force was a gentle, then insistent evolution of human growth and development coupled with the realization that unless this opportunity were grasped, it would be many years before humankind would be able to give overt expression to such inner spiritual strivings.

Social Systems

The world in 2000 looked so different from that which had existed in the mid-1970s that an older generation had difficulty in explaining to a younger what had been and in explaining to itself how the change had come about.

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By 1976 the industrial nations were patently in crisis. There had been no real breakdown, but there seemed no end in sight of economic recession combined with continuing inflation. International tensions continued high but the developed nations were too demoralized to go to war, the undeveloped were either too weak or too preoccupied with their own quarrels, and the developing concentrated on their internal expansion programs.

Within the United States, Western Europe, and Japan the sense of crisis produced governments of national unity able to impose systems of controls on energy use and other forms of consumption and to organize massive programs for the development of new energy technologies. Awareness of the size of the problem induced them increasingly to pool their resources and internationalize their programs. Paradoxically, the growth of national and supranational unity was accompanied by the flourishing of diverse lifestyles. Individuals and communal groups, even while cooperating with the national effort, were increasingly active in devising new responses, both economic and social, to the imposed austerity. Such responses typically were marked by more individual and group self-reliance, ingenuity, and tolerance. As the 1980s wore on without achievement of the technological successes that had been hoped for--and despite a general worsening of the overall economic situation, expressed particularly in shortages of some kinds of foodstuffs and rising food prices--these frugal groups and individuals, while still patiently supporting the continuing efforts of the governments, grew markedly in numbers and influence. Indeed, it was their self-sustaining efforts that largely prevented collapse and revolution. They had a remarkable ability to recruit into their ranks not only the educated and able who saw no immediate future in the declining yet still dominant business sector, but also the disadvantaged, the minorities, and the elderly.

In effect, a parallel system (or systems) of self-governing, self-regulating communities concerned with both economic survival and personal growth expanded alongside the faltering but still functioning structure of corporate manufacturing and service. For the older generation, particularly, the experience was one of reduced expectations and defeat, but for many, even in that generation, the experience was positive and liberating. Although these communities showed a diversity of forms and styles, the overall trend was toward a homogeneity as informal communications networks transmitted the news of what worked and what did not. It was the existence of this network that ensured against the shattering of national economies into isolated, feudal pockets. Major elements of the surface transportation system, for instance, became owned and maintained by frugal cooperatives in the 1980s and 1990s. International contacts among these groups were increasingly extensive and formal.

Gradually and unofficially the lineaments of a post-industrial, low growth, diversified, and decentralized world system were taking shape even as official faith was maintained in a return to the old system once "the energy breakthrough" occurred. However, by the late 1990s, elections in the United States, Europe, and Japan revealed that the old system was just about defunct. The system of controls and the investments in the big, high-technology energy projects were scrapped. The post-industrial system, committed to low technology, "small is beautiful," humane and self-fulfilling goals and a spaceship Earth philosophy, had emerged.

To a surprising extent, these developments were paralleled in much of the rest of the world. After an initial spurt in consumption during the 1970s and early 1980s, the Middle East nations, troubled by industrial pollution and the erosion of traditional Islamic values, began to emphasize the old virtues of a simpler, patriarchal, and pastoral society. The task was made easier by extensive land reclamation programs that required the settlement of great numbers of urban youth on agricultural

SCENARIO 4

Social Systems

1980	1990	2000
pluralist world →		increasingly homogeneous world with cultural diversity
national state →		supra-national order
increasingly rational →		→
internal heterogeneity →		homogeneity
low consensus →		high consensus
territorial ethic →		spaceship ethic
rigid →	adaptive →	homeostatic
individualistic →		cooperative individualism
active →		→
responsive →		→
immature →	adolescent →	mature
rapid change →	slowing →	dynamic equilibrium
fairly easy change →		→
system malfunction →		continuity
centralization →	decentralization →	→
technocratic ethic →		humanistic mass
discontinuous →		continuous

developments that were modeled on Israeli kibbutz with overtones of Soviet-style collective agriculture. In the Soviet Union and Eastern Europe--already used to low consumption lifestyles, low birthrates, and relatively large agricultural populations--there was a similar movement. Deeprooted tendencies growing out of traditional Slavic mysticism and peasant traditions reappeared, drastically changing the style of Soviet life without, however, reducing the influence of the Communist party, even as the party adapted to the new situation. In China the agrarian, self-reliant system begun in the 1950s merely continued. In other parts of Asia, Africa, and in Latin America, problems of mass rural poverty, conurbation, and debased traditionalism were too great to be ameliorated significantly by any change of heart. Frugality for the poor of these regions was nothing new. Increasingly, Malthusian solutions for their Malthusian problems were tried toward the end of the century.

Productive Systems

In this scenario we have the slow evolution of all of the basic economic, social, and scientific institutions of society. This evolution arises in part from necessity (e.g., scarce resources) and in part from a guiding sense of what a better society could be like. Thus, while the contrast between 1975 and the year 2000 is profound, the process by which that change took place was quiet and slow.

The highly concentrated industrial corporation of 1975-1980, motivated by profit, slowly was displaced by a decentralized, smaller scale economic enterprise whose measure of success was more utility than profit. So long as the business community failed to respond to social needs, the people usually supported government's regulation of industry no matter how ineptly applied. As the new business slowly emerged and old ones changed in the late 80s and 90s, it was increasingly evident that they could be self-regulating, serving the common good as well as their own

SCENARIO 4

Productive Systems

1980	1990	2000
production for profit		production for use
concentrated industry	fragmented	decentralized
inept government regulation		sophisticated self-regulation
diminishing faith in science and technology		faith in intermediate technology and basic science
industrial		post-industrial
slowly declining GNP	static	dynamic equilibrium
differential income distribution		equalization
slow population growth		stabilizing
corporatization		globalization
knowledge elite		knowledge mass
need for technological development		effective use of existing technology
information base		wisdom/shared information
perceived resource scarcity		sufficiency

needs. Now, this process did not happen easily for all. Many firms, particularly some of the very large manufacturing companies, went under in the 1980s, throwing tens of thousands out of work. Thus, from the late 1970s through 1990 the GNP slowly declined, bottoming out and leveling off in the early 90s in a kind of static equilibrium. By 2000, however, growth had resumed, but it was a growth carefully managed so that the net was a dynamic equilibrium. Both the movement toward equilibrium and the deterioration of the economy meant that the income gap tended to narrow, but with the mean income declining.

As the economy changed, so did the science and technology establishment, until by the year 2000 one could hardly have called it an establishment. The scientific knowledge elite had hitched its star to ever increasing material abundance (e.g., "progress is our most important product," "better living through chemistry"). When that promised affluence failed to continue people lost faith in the old R&D establishment. As with industry, a new kind of scientific community emerged in the 80s, though signs of it were there already in 1975 (e.g., The New Alchemy Institute, Community Technology, Inc., The Energy Primer). In the 90s science and research were activities pursued by a great many people of all backgrounds in a variety of settings. By 2000 conditions improved sufficiently to allow some significant support for basic science and the highly selective development of large-scale technologies.

Ecosystems

Even during the troubled days of the early 1980s the rudimentary structure of a systems approach to environmental concerns and an awareness of differentiated growth were present. While survival demanded certain liberties be taken with the environment during this period, the basic principles were not abandoned, and the crossing of the critical threshold was guarded against.

SCENARIO 4

Ecosystems

1980	1990	2000
man over nature →	man in nature →	→
no critical threshold →	critical threshold recognized →	→
some environmental concern →	increasing concern and preservation →	→
resilient but destructible environment →	fragile environment →	environmental loading kept below threshold
managed systems view →	→	cybernetic systems view
undifferentiated growth →	differentiated growth →	→
first order consequences →	multiple order consequences →	→
action not urgent →	action increasingly urgent →	less urgent but active

As the societal condition improved throughout the 90s basic ecological principles spread with the growth of the frugal sector, until the predominant societal viewpoint was that man was one-with-nature and not opposed to it.

By the year 2000 there was a less urgent sense of action regarding the environment because the social and economic systems had been harmonized to work with nature rather than in opposition to it. This was evidenced in the evolving role played by the ecosystems protection agency whose charter was to act as an information and resource base rather than as a regulatory agency. The new image of man-with-nature largely disposed of the need for environmental regulation, but it created a greater demand for acceptable ways and means of cooperating with nature.

From the Literature

The "cowboy" economy of the industrial paradigm assumes unlimited resources and opportunities which no longer exist. A new paradigm is needed which emphasizes a shift from consumption to conservation, along with a redefinition of the "planned" (public) and "free" (private) segments of the economy.

The resulting new steady-state economy assumes a constant population, a lower level of material expectation among the people, and constant throughput over time.

Dennis Pirages and Paul Ehrlich,
Ark II.

The changing value structure which is fundamental to this scenario has primarily affected the U.S. economy through the rejection of the old "economic growth" philosophy of management. The new "dynamically stagnant" economy is more service oriented and has adopted new measures of performance which stress quality of life rather than national product. Most people live an economically decent life with a declining interest in raising their material standard of living.

Pacific House Associates, *An Organized Look at the Future (I)*.

The next several decades are seen as a period of enormous sociocultural changes which, collectively, will constitute a transformation of the urban-industrial state into a more humanistic or, less hopefully, a more authoritarian society. In either case, the status quo is not expected to be extended.

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The acceptance of socio-cultural changes is central to the scenario. This acceptance is founded in the belief that change is both necessary and good, and a process which is to be participated in by everyone. As a result social and cultural differences are viewed as opportunities for new discoveries rather than threats to the existing order.

Pacific House Associates, *An Organized Look at the Future (I)*.

The predominant attitude toward the environment can be summarized as one of pragmatic conservation. A deep and genuine concern for the environment is weighed against the benefits to be derived by use of its resources and a workable balance is struck. Essential to establishing and maintaining this balance is a new attitude toward reduced material consumption and the development of new materials technology.

Pacific House Associates, *An Organized Look at the Future (II)*.

While politics and government are less emphasized there is greater participation in the political process by the citizens as increasing control is passed on to the neighborhood and regional councils which make decisions affecting the daily lives of the people.

Pacific House Associates, *An Organized Look at the Future (I)*.

Consistent with the emerging policy of pragmatic conservation of resources, the intent is to minimize the effects of necessary depletion while seeking ways to preserve and restore valued resources. Major efforts are being made in several areas, including alternative energy sources (thermonuclear, solar, tidal), synthetic mineral substitutes, and recyclable materials.

Pacific House Associates, *An Organized Look at the Future (I)*.

With the end of affluence will come a more rigid and inwardly directed social order. However, this will come not from a seeking of greater spiritual growth, rather it will arise from the closing off of other domains.

Robert Heilbroner, *An Inquiry Into
the Human Prospect*.

International relations during this period are those of tension among the great powers who will continue to compete with one another for military and economic advantage.

Center for the Study of Social Policy,
Changing Images of Man, Stanford
Research Institute.

The possibility of severe food shortages and famine in the lesser developed countries is relatively high.

Dennis Gabor, *The Mature Society*.

There is a need for more rationally controlled material technology and a new social technology which encourages and rewards ecologically sound behavior.

Science can no longer be viewed as apart from society, but rather must be considered as an integral part of it with a responsibility to that society for what it produces.

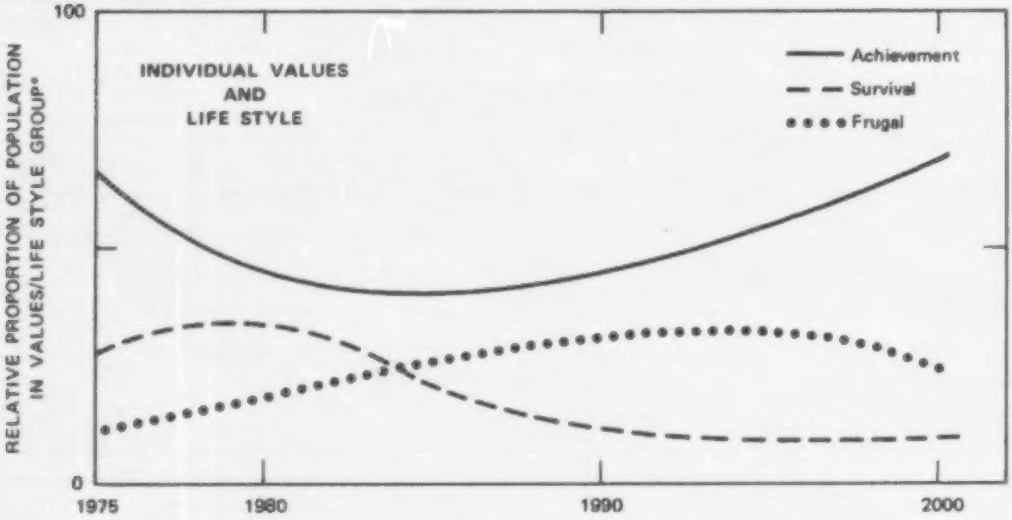
Dennis Pirages and Paul Ehrlich,
Ark II.

SCENARIO 5

"THE CENTER HOLDS"

Summary

The most significant among the variables controlling this future is the continued dominance of achievement values, even while energy shortages threatened, the climate worsened and living standards declined. Throughout the 1980's the big business, big agriculture, big government systems of the industrial countries were threatened, appearing at times to be totally inadequate to meet the needs of the societies they directed; yet they remained in control. There was public revulsion against the rising criminality and terror tactics of desperate survivor groups and their associated intellectual revolutionary apologists and sometime leaders. The frugal sector, which tried to go its own way without taking part in the repression or promotion of violence was condemned by both the revolutionaires and the conservative achievers. With important technological breakthroughs and a cycle of good weather worldwide in the 1990's, the achievers successfully restored, in great measure, the world system of the 1970's. The new system, however, was more centralized, more highly regulated, and more authoritarian than that of 25 years earlier.



	1980	1990	2000
ENERGY	continued high growth	continued high growth	controlled growth
CLIMATE	worsening	favorable	favorable
FOOD	high price, no shortage	moderate price, no shortage	high price, no shortage

Driving Trends

The combination of economic difficulties, a worsening climate, and the enormous capital needs of maintaining energy growth resulted in a new depression situation by 1980. More and more people were counted as middle-class poor, paying a high price for energy and food.

In the 1980s, the climate began to improve and new energy technology (nuclear, solar, coal gasification, etc.) turned the situation around. By 1990, new growth opportunities were abundant. While poverty still persisted, many of the middle-class returned to their climb toward affluence. However, many others, some who weathered the depression well and others who did not, opted for a much more frugal way of life, both out of a sense of caution and for some a spiritual motivation.

With the 1990s came a growing acceptance of the finite limits of the earth, leading to an effort to moderate growth. This process was carefully managed by a technocratic elite. With increasing affluence, many of those who had cautiously adopted a frugal way of life returned to a new kind of moderate materialism.

Individual Aspects

This future begins, as do the others, with a majority of the population holding values consistent with Kahn and Wiener's description of the "long term multi-fold trend"--rational, individualistic, secular, materialistic, mechanistic, scientistic. The rapidly worsening external circumstances of the late 1970s and early 1980s created increasing distrust of traditional values and led to active experimentation with alternative values. Consequently, in the early and mid-1980s there was an increasing shift of population from the traditional value cluster of achievement/survival toward the value cluster inherent in the "frugal sector"--a blending of rational and intuitive, a desire to voluntarily

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Individual Aspects

1980	1990	2000
rationalistic	rationalistic/intuitive	rationalistic
rigid/adaptive	adaptive	increasingly rigid
passive/active	active	
self-interest	self/social consciousness	rational social consciousness
conspicuous consumption	experimental frugal	conspicuous consumption
immature	experimentation	mature
materialistic	materialistic/non-materialistic	materialistic
secular	secular/spiritual	secular
industrial image of man	experimentation	successful mature industrial image of man
Epoch A	watershed	Epoch A regained
little ecological concern	physical ecology dominant	mature/rational concern
science response mode	science/wisdom	science
little anticipatory action		managed anticipatory action

simplify the external aspects of life in order to secure a greater internal/inner life, enhanced cooperation/participation, a more holistic/systemic perspective extending to future generations, and a taoistic sense of ecology extending beyond concern for only the physical environment to include the psychic environment as well.

The influence of "frugal values" reached its peak in the late 1980s, by which time the more traditional achievement sector of the population had an opportunity to assimilate necessary elements from this more experimental sector and thereby making itself more "mature" in Gabor's sense of the term. The co-optive role of the "achievement" sector, plus its dominance in absolute numbers, allowed it gradually to reassume a position of value dominance as well, so that, by the year 2000, the achievement sector was clearly dominant once again. The growth of the frugal sector--much like the emergence and submergence of the 1960s counterculture--had a significant impact on the overall society, though its explicit traces were difficult to find in the social form that prevailed at the turn of the century. The frugal sector gave a frame of reference which the dominant sector drew upon in tempering the growth ethic as it developed a mature, successful, and more responsive and managable urban-industrial society.

Social Systems

The basic societal institutions of the free-market industrial nations --particularly the United States--came under severe stress, appearing at one point to be on the point of disappearing, but were clung to by a majority of the people throughout and, in the end, retained in modified form when the many alternatives proposed to them were shown to be even less adequate to the crises of the period. The nation-state as the major focus of loyalties, the nuclear family, extended education, the job-income nexus remained the context in which most people expected to live their lives and through which they would gain their rewards. Big cities, big industry, and big government, all relying on big and complex science and technology, remained characteristic throughout the period. Although saving, deferred gratification, and self-reliance remained the major social virtues in actuality a hierarchic welfare state made personal savings less important while a permissive, high consumption materialist ethic both discouraged saving and encouraged instant gratification. Perhaps the societal change that made the most visible difference was the decline in private automobile ownership. Another was the decrease in private home ownership as more and more Americans adopted the European style of apartment dwelling in large cities rather than owning the detached suburban house. These changes added to the sense of increasing homogeneity among developed world societies.

The variety of competing economic and societal systems (that were actually fairly similar) operated through the medium of the nation-state. Throughout the 1980s the dominance of the nation-state ideal over that of international order contributed to a low level conflict situation being generalized. Cold war occasionally kindled and flared, but the threatened general conflagration never resulted. By 1990 the turbulence subsided into a form of general, but wary, world detente. Gradually, as a generally industrializing world developed more homogeneous characteristics in all nations--pluralism becoming more ritual than reality--the nation-states increasingly subordinated their individual interests to that of international order.

Before that, however, the competitive world situation, combined with frustrations resulting from the depressed economic conditions of the late 1970s and early 1980s, was expressed in irrational political and social behavior. More than one act of nuclear terrorism occurred. The more familiar varieties of sociopolitical violence became endemic--assassinations, political kidnappings, massive sabotage, capital frauds, autonomous police repressions, military coups, crop and livestock destruction, strikes and lockouts. The association of such acts with all groups, both violent and nonviolent, who were advocating social change resulted by the 1990s in massive rejection of change and a determination to restore order along the old familiar social lines.

The beneficiaries of this determination were the traditional elites of government and big business with their allies in academia and the military. The informal terms under which this leadership agreed to assume responsibility during the "reaction" of the 1990s included political reform that limited popular participation in the decision making process and reduced the power of mass political parties; resumption of scientific and technological activity subject only to their control; and an end to egalitarian policies designed to reduce income and wealth differentials.

By 2000 the "establishment" was more firmly seated than ever and the political process was more restricted in most countries than before. Among the elite, particularly, pluralistic life styles were condoned and there was no attempt at restriction of thought and expression in the universities. For the non-elite, though, deviations from standard societal norms were discouraged although usually by community action rather than elite interference.

The trend toward internationalization and societal homogeneity was enhanced by the close connections established among like-minded elite in all countries. The minority in the Western European and American populations who had opted for a frugal lifestyle during the 1980s fell into disfavor, for two reasons: first, in the popular mind, these groups were associated with the breakdowns and political terrorism of the 80s, and this was remembered far more vividly than the poor economic conditions which originally had been blamed on the business and government leadership; second, the return of the good weather cycle and improvement in the energy situation allowed a partial return to the old industrial lifestyle.

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Social Systems

1980	1990	2000
pluralist world		homogeneous world
nation-state prevails	nation-state/ international order	
irrational	rational	
internal heterogeneity	homogeneity	
low consensus	high/low	high consensus
lifeboat ethic	territorial	scientific spaceship
rigidly adaptive	experimental	rigidly adaptive
elite control	elite/mass struggle	individual elite dominating a collective mass
active		
immature		maturing
rapid change		slowing change
hard change		easy change
systems malfunction	continuity	
centralization	decentralization	centralization
technocratic ethic	mixed technocratic/humanistic	technocratic
continuous	discontinuous	continuous

Productive Systems

As in the 1930s depression, a number of lessons have been learned from the depression of the late 1970s and early 1980s. While this depression was only in part induced by the energy crisis and the worsening climate, it was certainly ended by the improving climate and the growing availability of new energy technology. The high degree of economic concentration in the hands of a relatively few major corporations underwent a fairly significant dispersal during the 1980s. The next decade saw a regathering of that power in the hands of a new kind of management, however. The new economic giants were self-regulating and aware of social responsibility. While they still sought profit, usefulness evolved into a more important criterion of success. Part of their success was due to the gradual narrowing of the range of income distribution from the great disparity of the late 1970s. The declining GNP of the early 1980s grew slowly through the rest of the decade and on into the 1990s. However, being aware of both the inevitability of bust following boom and the finiteness of earth, they carefully managed the economy toward an equilibrium state.

The depression years saw a diminished faith in the power of science and technology but when the new energy technology finally came through in the mid-1980s, that faith began to recover and was fully restored by the successes of scientific managers of the 1990s. They took a situation of scarcity in 1980, created abundance by 1990, and finally tempered the abundance by 2000--"for our own good, lest we grow too fat on a rich diet."

As in the previous depression, this one also precipitated a decline in the birthrate. That birthrate never really grew much; thus population growth was very slow over the two-decade span. By the year 2000 the population level was approaching stabilization. However, advances in health care that extended the life span tended to encourage some growth again.

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Productive Systems

1980	1990	2000
production for profit →	profit/use →	
concentrated industry →	some dispersal →	concentrated
government regulation →		self-regulation
diminished faith in sciences and technology →	resurging faith →	recovered faith
ineffective knowledge elite →	effective knowledge mass →	new information elite
unsuccessful high regulation →		knowledge based self-regulation
negative GNP growth →	moderate growth →	tending toward equilibrium
scarcity →	abundance →	limited abundance
inadequate information base →	information/wisdom →	information
significant income differential →		income equalizing

Ecosystems

The concern for ecosystems and the environment in this scenario is best characterized as an "operations research" approach. The systemic nature and dynamics of the ecosystems were well understood and efficiently used; however, the unifying bond between man and nature was not.

In the period of rebuilding which followed the depressed 1980s, the growing frugal sector was influential in establishing a new relationship between man and nature. It successfully advocated the need to distinguish between differentiated and undifferentiated growth, and the need to view ecosystems in a holistic, interactive manner. The frugals failed, however, to effect a true, society-wide values shift to a taoistic view of man in nature.

The prevailing achievers appreciated and used the dynamics of ecosystems to manage the environment efficiently. While they recognized that it could be disrupted to the point of collapse, they were likewise confident in their ability to establish what the limits of environmental tolerance are and not to exceed them.

SCENARIO 5

Ecosystems

1980	1990	2000
man over nature →	man equal to nature →	man over nature
recognition of a critical threshold →		preparing to avoid the critical threshold
environmental conservation →		
resilient, unmanaged environment →		resilient, managed environment
discrete view →		systems analyst view
undifferientated growth →		differentiated growth
action less urgent →		

From the Literature

Energy is not a serious problem--new technology, e.g., solar, nuclear, tidal, ocean, thermal is being successfully applied.

Arnold Mitchell, *Life Ways and Life Styles*, Stanford Research Institute.

There is the implicit assumption that population growth will not present a major problem domestically--that we tend toward a stabilized population.

Center for the Study of Social Policy, *Changing Images of Man*, Stanford Research Institute.

Where the institutions of the post-industrial society will be very highly structured and the behavior of people within them will be closely constrained and controlled by them,the whole sphere of noneconomic personal relationships will be marked by the greatest freedom and diversity.

Daniel Bell, *The Coming of the Post-Industrial Society*.

Dissent is only minimally tolerated--arrests of dissidents are frequent.

John Brunner, *The Sheep Look Up*.

> One cannot have political power without political obedience; one cannot have strong government without a sense of national identification.

Robert Heilbroner, *An Inquiry Into the Human Prospect*.

The wealth of goods and services that technology creates fosters a widespread public faith in the benevolence of that technology, and an equally strong faith that any corresponding environmental degradation or ecological imbalances can be corrected through the application of sufficient money and further technology.

Philip Wylie, *The End of the Dream*.

The United States continues to be highly dependent on science and technology. The prevailing concern for environmental and resource conservation has, however, caused a shift in the emphasis of basic and applied research. Much of the effort is now directed at developing labor intensive devices and systems which are compatible with the new standards of technological assessment.

Pacific House Associates, An Organized Look at the Future (II).

Science is increasingly bureaucratized and managed in accordance with meeting the communally expressed goals of society. More and more people are employed as scientists and technicians. However, the attention of science is given more to the management of externalities, the recycling of wastes, and the increase of productivity than it is to the development of new products.

Daniel Bell, The Coming of the Post-Industrial Society.

The trend toward concentration of economic power continues, resulting in a near total dominance of the large corporation in nearly all aspects of American life.

John Brunner, The Sheep Look Up.

The United States, leading the rest of the world into the post-industrial age, remains highly productive and prosperous with high reliance on new scientific discoveries and technological application. Few people are employed in production, however. Most new occupations are in a highly elaborated service sector.

Daniel Bell, The Coming of the Post-Industrial Society.

American economic health depends now and will continue to depend on organization and support for the production of new knowledge and its export to other countries. The other major U.S. economic advantage lies in its superior knowledge of management and organizational techniques. These, applied to the management of multinational corporations, will continue to be responsible for the health of the American economy.

Peter Drucker, The Age of Discontinuity: Guidelines to Our Changing Society.

The abdication of power in international politics and the abandonment of overseas military bases signal a general decline in the Cold War. Traditional alliances tend to disintegrate in the wake of widespread support of international bodies. There is a rise to unrest in small and developing countries, but in general there is evidence of an improved international stability.

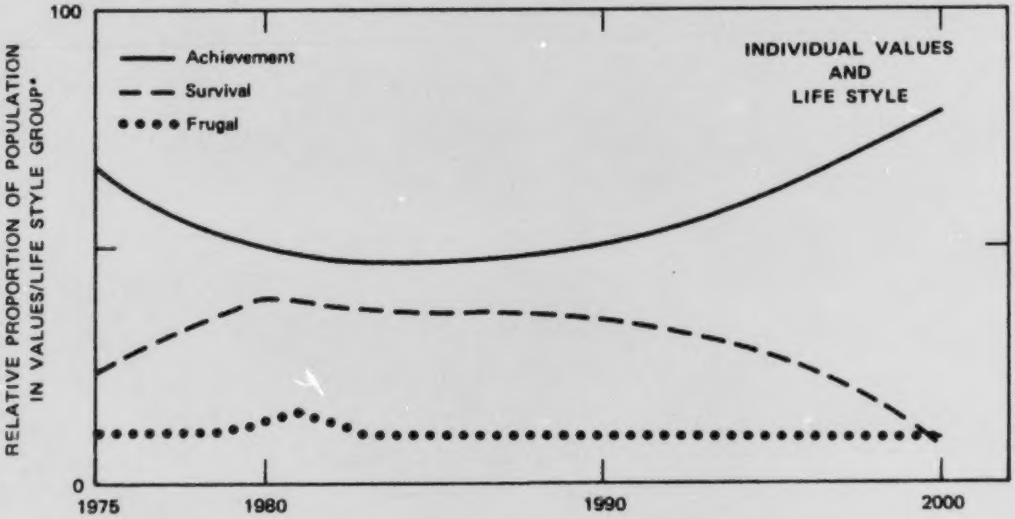
Arnold Mitchell, Life Ways and Life Styles, Stanford Research Institute.

SCENARIO 6

"THE BOOM YEARS"

Summary

In the late 1970's attempts to control growth in response to the energy crisis resulted in a deep and extended recession — large numbers of people had to severely reduce their standards of living. This recession increased the proportion of people seeking a frugal way of life in the 1980's. At the same time new energy technology and resources were applied effectively to end the recession and speed recovery. By the late 1990's, the United States was back on its historic track of ever-growing affluence and mastery over the world around it. The promise of comfort proved irresistible to many of those who had sought the frugal path, so that by 2000 the frugals were a relatively small minority.



	1980	1990	2000
ENERGY	controlled growth	continued high growth	continued high growth
CLIMATE	variable	favorable	favorable
FOOD	high price, no shortage	moderate price, no shortage	moderate price, no shortage

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Driving Trends

Following the energy crisis of 1973-1974, the United States tried to slow its growth in energy consumption in the expectation that new technology and resources would eventually allow the resumption of the historical trend. However, there was little agreement on how to best effect this control. Moreover, the problem was exacerbated by an unpredictable climate. Thus, by 1980, the United States was in the midst of an extended recession, with a sizable proportion of the population experiencing reduced consumption standards.

An improving climate and the hoped-for arrival of new energy sources led to a rapidly improving situation in the year 1990. Coal gasification, nuclear power, limited solar (heating and cooling), and some geothermal plants began to move on-stream in the mid-1980s. As the price of energy declined again and its availability became more assured, the economy began to recover. By 1990 many people were again on the path of rising affluence. However, some (not a large proportion) opted for a more frugal way of life, having gone through nearly a decade of relative deprivation. The continued success of the 1990s drew most of those people back into the consumption mainstream.

The turn of the millennium was celebrated in an atmosphere of ever-rising affluence. Cheap and plentiful energy and food made economic growth seem an unbounded possibility.

Individual Aspects

Moderately adverse circumstances (variable climate and high food prices, with simultaneous inflation and unemployment) created a situation in the late 1970s and early 1980s where the number of persons in the achievement sector was declining and the number in the survival sector was growing. An extended recession characterized the period of the

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Individual Aspects

1980		1990		2000
rationalistic	→	rationalistic/instinctive	→	rationalistic
rigid	→	adaptive	→	rigid
passive	→	active	→	passive
self interest	→	self/social interest	→	self interest
conspicuous consumption	→	conspicuous/frugal consumption	→	moderated conspicuous consumption
immature	→	adolescence	→	mature
materialistic	→			→
secular	→			→
pragmatic	→			→
competitive	→	competitive/cooperative	→	competitive
valuing present generations	→			→
industrial image of man	→		→	mature industrial image of man
Epoch A	→	watershed	→	mature Epoch A
little ecological concern	→		→	physical ecology
science response mode	→			→
cyclical	→			→

1980s and early 1990s. By the year 2000 the underlying problems had been largely solved.

Most people held onto the values of the industrial paradigm--rationalistic, materialistic, mechanistic, scientistic, secular, pragmatic, and individualistic. The rise of the survival sector did not negate this value constellation; rather, this group continued to aspire to the "good life," as found through these values, and awaited the reemergence of better times when they could again fully manifest these values. At no point was there any serious shift away from industrial values toward, say, the frugal/unfolding value constellation, although a small minority did adopt these values during the depth of the depression. Their attachment to such values and lifestyles was short lived and disappeared as soon as external circumstances (i.e., an improving economy) allowed them to filter back into the mainstream of American life.

Social Systems

Breakthroughs in energy technology came about by the mid-1980s. Achieved almost simultaneously by national energy projects in the United States, Japan, the Soviet Union, and in Western Europe, the new technologies freed the industrial nations from dependency on third world sources of fuel and, even more significantly, allowed the working of such low-grade ores as to establish self-sufficiency in raw materials. The result was the initiation of a new binge of industrialization and economic growth, free not only from any necessity for national competition but from any real necessity for international interdependence, trade, or cooperation. On the other hand, even as each industrial nation eliminated poverty and reached levels of general affluence worthy of Kahn at his most expansive, the surplus available to distribute in programs for the poor nations amounted, almost, to the realization of people's wildest dreams. By the year 2000, the Age of Affluence dawned. Scarcity was a word without current significance. Triumphant scientists were confident that the old recurring problem of entropy--the only believable threat to the survival of their utopia--was not insoluble.

The world political map remained unchanged. Even the smallest nations were economically viable: each could indulge in the luxury of an individual, national lifestyle. However, since the optimizing principle of one best way predominated, the highly materialistic mode of life tended to reproduce itself almost everywhere. The exception was in the determinedly puritanical societies of Communist Asia. But even there the conviction that it was better to be "red" than "expert" had declining force as less and less human effort was required to produce more and more goods. Everywhere the frugal ethic and its adherents who had been gaining strength in the late 1970s and early 1980s lost credibility as the application of the new energy technology belied their predictions of shortage and their assertions of the need to conserve and live sparingly. The achievers resurrected Kahn's statement of the mid-1970s to the effect that by adopting the frugal ethic the world could quit poor, or by keeping faith with the growth ethic it could retire rich at a later date.

As noted above, there was no need for much cooperation nor, conversely, for much competition among nations. Hence, neither the lifeboat nor spaceship styles prevailed. The seabottom and its mineral resources were parcelled out on the basis of international treaty, and the nations agreed among themselves through treaty arrangements to control environmental spillover across borders. Moreover, in the new era of national self-sufficiency, many of the issues rooted in maldistribution of resources and wealth--whose solution had seemed to require greater international or world organization--no longer seemed pressing.

Within the nations the major problems of societal adjustment lay in coming face-to-face with the utopian issues of affluence and leisure. Through the 1990s the swing back to the achievement values implied renewed commitment to the traditional principles of work, striving for advancement, making the most of the new opportunities. By 2000, however, a major shift toward more hedonistic, experimental lifestyles was underway. On the one hand, enormous creative energies were released and more and more people sought both personal liberation and cultural achievement. On the other hand, a pathological, asocial, self-destructive side of human nature expressed itself more and more in meaningless crime, alcoholism and drug addiction, cultism, superstition, boredom, and high rates of mental illness and suicide. While the high prosperity of the era made these outcomes relatively tolerable and victimless crime was no longer prosecuted (consenting adults could live highly individual and even bizarre lives), controlling elites were worried enough to begin to devote research to genetic engineering, psychological, and psychochemical means for keeping the population within bounds of acceptable behavior.

The dominance of great corporations and the relative weakness of government, plus the development of Kelso-type stock distribution plans, tended to produce a form of corporate citizenship. This was not industrial democracy; on the contrary, corporations continued to be elite dictatorships. However, the Japanese model of employment tenure was widely adopted in the 1990s. Security of employment, permitted by the general affluence and, in a time of reduced population growth rates, also desirable because of a general shortage of new workers seeking to enter the labor force, further induced adherence to corporate goals and values by the general population.

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Social Systems

1980		1990		2000
homogeneous world	→		→	
competitive nation-state	→	cooperative nation-states	→	
rational	→		→	
internal homogeneity/ heterogeneity	→	homogeneity	→	
mixed consensus	→		→	high consensus
territorial ethic	→		→	
rigid	→	rigid/adaptive	→	
collectivist over individualistic	→	collectivist	→	elitist individualism/ collectivist
active	→		→	
responsive	→		→	complacent
rapid, easy change	→	rapid change	→	easy change
system malfunction	→	system functional	→	continuity
competitive	→	cooperation among large power centers	→	
technocratic ethic	→		→	
continuous	→		→	

Productive Systems

In the sense that this scenario is a temporary diversion of Kahn's long term multi-fold trend of continuing techno-industrial growth, most of the elements of the world system of 1975 survived to the year 2000. The temporary detour of the late 1970s and early 1980s was in part due to a perception of resource scarcity and the inept regulations placed on industry by government in order to slow growth. The income distribution problem, which worsened very dramatically during that period, was substantially eliminated by the year 2000. Although there was an ever widening gap between the top and bottom incomes, the incomes of both groups were rising fast enough so that the issue of the differential became unimportant.

Power came increasingly into the hands of the managers of great corporations. However, they did not organize themselves into a single corporate monolith. Rather, discrete sectors of the corporate community became increasingly concentrated. Within those sectors the giants became largely self-regulating, with the government playing largely a coordinating role. Industrywide organizations based on such models as the American Petroleum Institute and the Electric Power Research Institute became central organizing vehicles for this process. By the year 2000 such organizations were playing an important role in the economy. As their domestic power increased, the corporations also became the means for developing globalization, or what is better described as corporatization.

Rising affluence gave impetus to the movement of employee ownership in the corporation. As every worker came to have greater discretionary income and was motivated to participate in the capitalist system, employee stock purchasing plans on the model of Louis Kelso's two-factor theory, began to extend to all levels of workers. This investment by workers in

SCENARIO 6

Productive Systems

1980	1990	2000
production for profit	→	→
concentrated industry	→	→
government regulation	→	→ corporate self-regulation
continued faith in science and technology	→	→
industrial	→	→
knowledge elite	→	→
negative GNP growth	→	→ high growth
perceived resource scarcity	→	→ abundance
slow population growth	→	→ increasing
differential income distribution	→	→

their shared enterprise helped fuel economic growth, which had slowed in the late 1970s and early 1980s but was again accelerating in the year 2000.

Ecosystems

Environmental protection had a very low priority during the late 1970s and early 1980s. The concept of ecosystems, when understood, was certainly not appreciated. During the recovery period of the late 1980s, priorities had to be established in order to "get things under control." While most people recognized that the environment could be significantly fouled by man's waste, they saw environmental degradation as a necessary cost of getting back on the road to economic recovery. Dirty air seemed a small price to pay for a job and food on the table.

The relatively minor frugal sector was unsuccessful during this period in warning of the long term, potentially disastrous effect that environmental abuses could cause. Few people truly comprehended and appreciated the vulnerable character of ecosystems, and those who did chose to put their faith in man's ability to find a solution to the problem when and if the need arose.

As recovery took hold and progressed through the 1990s, there was more tolerance in the system for ecological considerations. By 2000, the concern for the environment had regained a higher priority. However, the basic philosophy of man's supremacy over nature had not changed. The attitude seemed to be "let's shape up this world so it will be a better place for man."

SCENARIO 6

Ecosystems

1980 1990 2000

man over nature ——————————————→

critical threshold recognized ——————————————→

disregard for environment ——————→ concern for environment as a resource

resilient environment ——————————————→

discrete view ——————————————→

undifferentiated growth ——————————————→

first order consequences ——————————————→

action less urgent ——————————————→

From the Literature

The United States, leading the rest of the world into the post-industrial age, remains highly productive and prosperous with high reliance on new scientific discoveries and technological application.

The multinational corporations increasingly bind the whole world into an interdependent economic unit. The developed nations which serve as their headquarters specialize in knowledge creation and knowledge processing, while the standardized kinds of production are carried out within the lesser developed countries.

Daniel Bell, The Coming of the Post-Industrial Society

An increased rate of highly organized scientific research and discovery in all fields will be typical of the period.

It is expected that agricultural science and technology will make new breakthroughs. Agriculture will be the fastest growing of all world industries in terms of productivity.

More and more the function of international relations will be the establishment of appropriate rules for the free play of the private multinational corporations as they develop the "global marketplace" and provide the impetus for development within the poorer countries.

The presumption is that the combination of science and technology with skilled management will, if government acts only to express society's desires and needs for a protected environment, develop the appropriate ways and means for dealing with such environmental problems as may arise. The complementary need is for government not to constrain the enterprise with strangling regulation that impedes the adoption of new or substitute materials.

Peter Drucker, The Age of Discontinuity: Guidelines to Our Changing Society

In the context of a world economy it is the multinational corporation of U.S. origin rather than the United States per se that is the engine of U.S. economic growth and power.

A truly international, interdependent economy develops through the agency of the multinational corporations. The pace of development increases. As standards of consumption rise, nationalism and ideologies play less and less of a role and the gaps between living standards in "developed" and "lesser developed" nations are less likely to be politicized and disruptive. Especially, raw materials (particularly oil) are freely transferred and do not become weapons of international politics.

Foreign relations are enormously important in a multipolar world in which the nation-state remains the major actor even though the economic system in which it operates is increasingly an integrated world system. However, the activities of the multinational corporations serve to mitigate the potentially dangerous effects of such a development.

There is absolutely no possibility of any mass food shortages during the period. The Green Revolution has solved the problem effectively. The major food and agriculture problem will be that of food surpluses.

Herman Kahn and B. Bruce-Briggs, Things to Come: Thinking About the 70s and 80s

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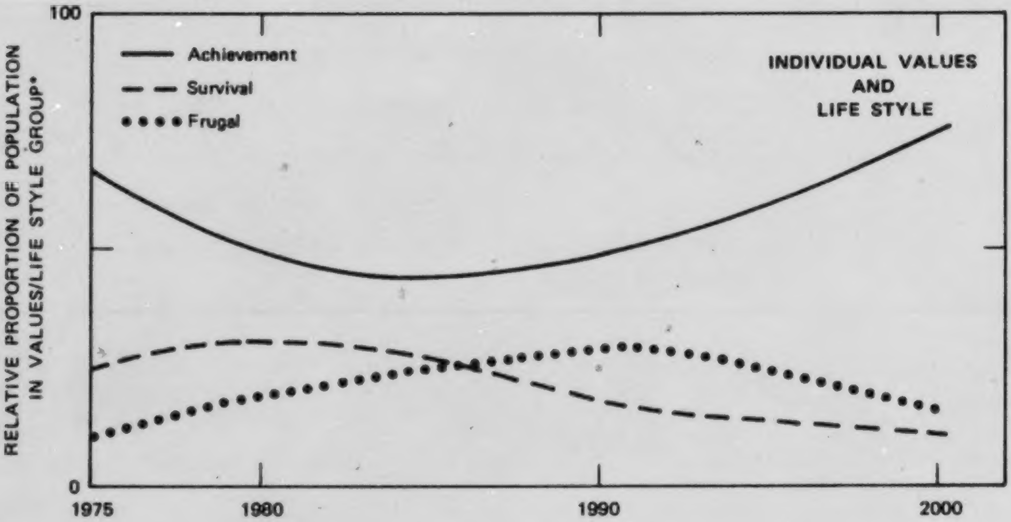
SCENARIO 7

"THE INDUSTRIAL RENAISSANCE"

Summary

An extended recession through the early 1980's was brought on by inept efforts to control energy consumption. Growth was indeed curbed but at a high economic and social cost. The need for control was largely eliminated in the late 80's by the advent of new technology, leading to a period of high growth. That growth was facilitated by the large numbers of people who had opted out of the consuming system during the recession. By the late 90's the technological elite, in recognition of the finite nature of the earth, were making efforts—this time successfully—to control growth. At the same time, those who had opted for a more frugal way were again drawn into the mainstream.



	1980	1990	2000
ENERGY	controlled growth	continued high growth	controlled growth
CLIMATE	variable	favorable	favorable
FOOD	high price, no shortage	moderate price, no shortage	high price, no shortage

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Driving Trends

Attempts to control growth in energy consumption in the late 1970s were only partly successful. The rate of growth in energy usage was indeed slowed, but at the price of extending the recession through the early 80s. The variability of the climate added to the problem. By 1980 many people in the industrial world were experiencing severe economic distress. However, some coped with these hard times by seeking a new more frugal way of life.

Fortunately, by the mid-80s the anticipated technology and the expanded resources that it offered began to come on-stream in full measure. At the same time the climate was stabilizing and for the better. The period of the late 80s was a time of high growth and substantial recovery. That recovery was made easier by the large numbers who had opted for a frugal lifestyle, liked it and chose to live that way, thus reducing demands on the system and allowing those who yearned for more affluence to get it by 1990.

The scientists, engineers, and planners--in short, the knowledge elite--had rescued industrial society in the 80s. Their credibility was high. Thus, the 90s saw this elite with its new awareness of the limits of a finite earth establishing a more orderly system. By the year 2000 the growth rate had slowed considerably, and the debate was renewed as to whether an equilibrium state was possible or desirable. The continued success of this elite drew many away from self-imposed frugality back into the consuming mainstream.

Individual Aspects

The external dislocations of the late 1970s and the success of those who called for a new image of man encouraged many in the demoralized survival sector to undertake a spate of "frugal/unfolding" experiments in the 1980s. These experiments were attempts to create substantially different social and economic systems supportive of a frugal pattern of consumption and emphasizing the significance of inner human growth. Most of the experiments consciously attempted to simplify the external material aspects of life in order to gain greater abundance along nonmaterial dimensions.

Although such experiments were moderately successful, they did not endure long enough to sort out the inevitable difficulties associated with such radical exploration--consequently, they never generated sufficient momentum to carry many people very far from the simultaneously maturing industrial-state paradigm. In characterizing the period of the 1980s, historians refer to it as a time when the "hippy movement with technology" blossomed. It captured the imagination of a sizable counterculture, and for a time, external circumstances (chronic energy problems, worsening climate) seemed to validate the appropriateness of its worldview. However, by the 1990s, without the force of external necessity, the frugal sector faded away as the dominant achievement sector co-opted many of the successful portions of the frugal experiments. By the year 2000, the frugal experiments appeared more as a childish fantasy played out in the wings of the American social stage--never having the billing, the cast, the props, or the rehearsal time to capture a large and serious audience. Nonetheless, the explorations of this subculture were, in retrospect, essential to the successful maturation of the dominant achievement sector--both as a source of creativity and as a frame of reference for analyzing the ills of the industrial society.

Social Systems

The social systems of the United States and the rest of the industrial (and industrializing) nations passed through 25 years of rapid, but largely

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Individual Aspects

1980	1990	2000
rationalistic	rationalistic/intuitive	rationalistic
rigid	increasingly adaptive	increasingly rigid
passive	increasingly active	increasingly passive
self-interest	self/social interest	self-interest
conspicuous consumption	frugal/conspicuous consumption	moderated conspicuous consumption
materialistic-	materialistic/non-materialistic	materialistic
secular	secular/spiritual	secular
pragmatic	pragmatic/idealistic	competitive
immature	adolescence	mature
industrial image of man	experimenting with new images	mature industrial image
Epoch A/watershed	Epoch A/Epoch B	mature Epoch A
little ecological concern	physical/taoistic ecology	physical ecology
cyclical view	cyclical/evolutionary view	cyclical view
science response mode	science/intuitive/wisdom	science

easy and smooth, continuous change. The disarray of the mid-1970s, marked by oil, food, monetary, diplomatic, and military crises provided an unpromising beginning for this change. An apparent world movement in the early 70s toward a more homogeneous and cooperative system, with detente and normalization of relations being its hallmarks, almost overnight reverted to a competitive situation in which each nation looked to its own interests and the securing of advantage.

Since the watchword for the 1970s almost everywhere was caution, crises did not produce any tendency toward bold and daring actions. Within the United States and elsewhere, full consensus was reached on the need to maintain international peace, to avoid economic or social breakdown (even during a time of recession and only partial recovery), and to cut back on high levels of individual consumption. Systems of rationing or of materials allocation were accepted. Credit controls, wage and profit limitations, and similar measures were imposed and acquiesced in.

By 1980, though, and especially in the United States, public patience with watching and waiting for the new dawn had begun to wear thin. Rationing and control systems were being evaded, and the promised breakthroughs in new energy technologies--viewed as the key to all problems--seemed as far away as ever. A sharp rise in the number of "survivors" was signaled by the revival of "welfare rights" groups and "gray power" organizations; strikes and demonstrations increased. Concurrently, the frugal ethic also began to attract more recruits. Efforts that had been devoted to maintaining the industrial system through a difficult period began to be diverted to the establishment of alternative, intermediate technology economies. This apparent shift began to dominate intellectual discussions, but in the mid-1980s, favored by consistently good weather worldwide and lowered food prices, the achievement sector was able to demonstrate sufficient success to remain very much in control. Then there came major breakthroughs in nonnuclear energy technology--coal gasification and oil shale processing, particularly, coupled with the exploitation of new offshore oilfields. These triggered a resumption of intensive industrial activity and a general achievement-orientation in society at large. Very quickly the whole system of controls and restraints was jettisoned.

The demonstration of renewed strength in the traditional industrial societies did a great deal to restore their international prestige. The multinational corporations, which had declined relatively during the previous ten years, found themselves being courted by the struggling new industries of the OPEC countries. Other developing countries began to renew and revive their connections with Europe and North America. A spirit of cooperative internationalism marked the era. Since the rich-poor gap among the nations had declined somewhat after 1975 as a consequence of new terms of trade as well as generally improved weather and agricultural productivity, and since many of the developing countries had come to be more self-reliant as a result of their isolation in the preceding decade, it was possible to use the period of international trade revival to reduce the gap further. This was a period of generally rising living standards which contributed to the further homogenization of social systems on the model of those of the traditional industrialized societies. The crew of spaceship Earth seemed to want to adopt the same uniform and regulations.

Even during this period of renewed expansion the elites within the industrial countries did not return to the old, unbridled quantitative growth ethic. For one thing, they were aware that the new resources were no more infinite than the old had been. For another, they accepted the warnings of scientists about the environmental hazards of the industrial process generally. Elite business and government leaders (usually indistinguishable) saw themselves as the responsible stewards of the earth.

Increasingly, international environmental and economic regulatory bodies were established to guide and provide policy for the world system that embraced all but Communist Asia, and even China and the nations within its orbit cooperated.

Within the world community and the nations comprising it there were still great areas of contention and competition. However, the material success of the 90s had been shared widely enough to result in a reduction of tension and to restore a sense of trust. There was, perhaps, less individual freedom in most nations but more individual security. The more humanistic science and technology did not present mankind with stark Faustian choices, and most of the world's population were happy to escape the disasters prophesied by Heilbroner and Meadows, and to settle for a revolution of reduced expectations. There were those, however, who regretted the end of fantasies of either unlimited wealth through the victory of allied science and capitalism or of the establishment of some new Jerusalem of moral regeneration.

The norms of social organization characteristic of the industrial countries of Europe and North America tended to predominate worldwide. The nuclear, one-generation family, usually with two or fewer children, became the average. Populations stabilized or even began to decline. Urbanization continued, but better planned satellite cities of manageable size tended to replace the sprawling conurbations of previous years. The apartment house more and more replaced the detached single family house as the usual dwelling, but parks, municipal gardens, community workshops, and so forth were adequate substitutes for home workshops and gardens.

A relatively aging population demanded less change and growth, hence adapted well to the controlled growth, reduced expectations, and more conservative tone of the period. However, the increased numbers of elderly demanded more medical services and income support. It became more and

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Social Systems

1980	1990	2000
pluralist world →	homogeneous →	
nation-state →	international order →	
nationalization →		
internal heterogeneity →	homogeneity with diversity →	
low consensus →	high consensus →	
lifeboat ethic →	territorial →	spaceship
rigid →	adaptive/rigid →	rigid/adaptive
collectivist →	individual elite over a collective mass →	
active →		
responsive →		
rapid, easy change →		
system malfunction →	continuity →	
centralization →	decentralization →	centralization
continuous →		

more customary for the older members of a family to live in the same apartment complex with the younger, thus allowing for a measure of extended family support for transportation, entertainment, and so forth. At the same time, grandparents were available to assist in child care and housework freeing more young women for paid work outside the home.

Productive Systems

The basic elements of the productive system underwent a relatively smooth evolution between 1975 and 2000, with only a temporary detour in the late seventies and early eighties. Chafing at the bit in a badly managed and highly controlled economy in the 1980s, industry suffered. The extended recession was costly in terms of major business failures. Throughout the 80s, however, large numbers of smaller, decentralized firms emerged to fill the gap, even as the surviving industrial economy was booming in a recovery spurred by new sources of energy. But a lesson had been learned. The 90s saw private enterprise expand its sense of social and environmental responsibility. Industrial leaders realized that unbridled growth could not be sustained and government control was too high a price to pay for lack of self-control.

Private corporate efforts to manage and control growth were aided by a very large cadre of scientific experts. That cadre made effective use of refinements in economic theory and, more important, very sophisticated data collection and information processing tools to keep a running check on the pulse of the economy--to manage and fine tune. The credibility of science and its power was enhanced by dramatic successes in solving the energy problem. By the year 2000 the technocratic information elite held the reins firmly. In fact the continued generation of productive knowledge became the key growth industry--nonpolluting, nonwasteful. Of

SCENARIO 7

Productive Systems

1980	1990	2000
production for profit →	profit/use →	→
concentrated industry →	some fragmentation →	concentrated
government regulation →		corporate self-regulation
industrial →		post-industrial (Bell)
declining GNP →	high growth →	moderate balanced growth
equalizing income distribution →		differential
slow population growth →		→
continued faith in science and technology →		→
knowledge elite →		information elite

course, as more and more people engaged in all manner of research, the structure of the scientific professions became more specialized, hierarchical, and rigid.

Ecosystems

Throughout this scenario a sense of man over nature prevails. The rationalist mind-set which dominated the era used an understanding of systems and an appreciation of differentiated growth to revive and maintain societal growth patterns. This "managed systems" approach was most evident during the recovery period of the 90s. As success was realized, the sense of urgency dissipated and a subtle shift in emphasis occurred. Second- and third-order consequences began receiving consideration as society came to feel it could look beyond tomorrow in its policy decisions.

Throughout the period environmental preservation was a volatile and highly debated issue. In the recession of the late 70s there was relatively little concern for the physical environment, but as the situation worsened ecological concerns grew among all sectors--but for very different reasons. The frugal sector saw the preservation of the environment as basic to its man-in-nature world view, while the achievers and survivors saw it as necessary for hoarding scarce resources. During the recovery period this attitude turned more activist and the achievers successfully advocated using resources to promote growth. By the year 2000 the diminished frugal sector held firm to its convictions, while the dominant achiever sector renewed its concern for the impact society was having on finite, expendable resources.

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Ecosystems

1980	1990	2000
man over nature →	→	→
→	→	emerging sense of a critical threshold
little but increasing environmental concern →	less concern →	conservation of the environment
resilient environment →	→	→
discrete view →	systems analyst view →	→
undifferentiated growth →	differentiated growth →	→
first order consequences →	→	multiple order consequences
action not urgent →	action urgent →	action less urgent but important

From the Literature

The United States continues to be highly dependent on science and technology.

Pacific House Associates, *An Organized Look at the Future (II)*.

Reform has restored public confidence in the ability of social and governmental institutions to resolve issues and cope with crises. As such, a new sense of optimism is prevalent, and the earlier trend of withdrawal into a closed, personal space has been reversed.

Pacific House Associates, *An Organized Look at the Future (II)*.

Although development policies pursued, under U.S. guidance, by all the underdeveloped world have been very successful in terms of absolute growth, the relative disparity between rich and poor nations has not been overcome.

Peter Drucker, *The Age of Discontinuity: Guidelines to Our Changing Society*.

The presumption is that the combination of science and technology and skilled management will, if government acts only to express society's desires and needs for a protected environment, develop the appropriate ways and means for dealing with such environmental problems as may arise.

Once again, the complementary need is for government not to constrain the enterprise with strangling regulation that impedes the adoption of new or substitute materials.

Peter Drucker, *The Age of Discontinuity: Guidelines to Our Changing Society*

> For most of human history, *reality was nature*, and in poetry and imagination men sought to relate the self to the natural world. Then *reality became technics*, tools and things made by man yet given an independent existence outside himself, the reified world. Now *reality is primarily the social world*--neither nature nor things, only men--experienced through the reciprocal consciousness of self and others. Society itself becomes a web of consciousness, a form of imagination to be realized as a social construction. Inevitably, a post-industrial society gives rise to a new Utopianism, both engineering and psychedelic. Men can be remade or released, their behavior conditioned or their consciousness altered. The constraints of the past vanish with the end of nature and things.

Daniel Bell, *The Coming of the Post-Industrial Society*.

The predominant attitude toward the environment is one of pragmatic conservation. A deep and genuine concern for the environment is weighed against the benefits to be derived by use of its resources, and a workable balance is struck.

Pacific House Associates, *An Organized Look at the Future (I)*

Consistent with the emerging policy of pragmatic conservation of resources the intent is to minimize the effects of necessary depletion while seeking ways to preserve and restore valued resources. Major efforts are being made in several areas, including alternative energy sources (thermonuclear, solar, tidal), synthetic mineral substitutes, and recyclable materials.

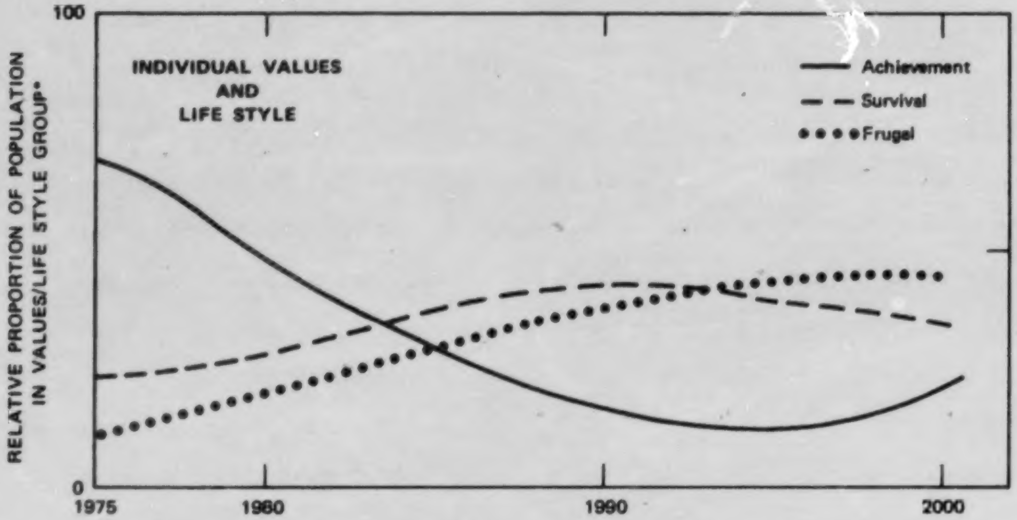
Pacific House Associates, *An Organized Look at the Future (I)*.

SCENARIO 8

"THE DARK AT THE TOP OF THE STAIRS"

Summary

In the late 1970's, efforts to control the demand for energy brought on a decade-long recession. By 1990, people learned to live with reduced levels of energy consumption. However, this was accomplished through the gradual withering of the industrial state and the slow, grudging acceptance of more frugal life styles. In the 90's the climate turned for the worse, pushing energy consumption up and the standard of living even lower. The end of the century marked the free market industrial world with near exhaustion, economic stasis and pessimism but with social peace, enforced by authoritarian regimes. Socialist industrial countries, better prepared by experience for these conditions, were little better off, but did not share the sense of trauma and defeat. Third world countries were left to their own resources and displayed a variety of social and economic conditions. Some were materially better off. Others, especially Latin American and African dependencies of the industrial nations, simply relapsed into primitive conditions in which cities became Calcuttas and the countryside reverted to primitive agriculture.



	1980	1990	2000
ENERGY	controlled growth	controlled growth	continued high growth
CLIMATE	variable	variable	worsening
FOOD	high price, no shortage	high price, shortage	high price, shortage

Driving Trends

This scenario is the tale of things going from bad to worse. The late 70s was a period of recession induced in part by unsuccessful efforts to control the growth of energy consumption. Adding to energy problems was a highly unpredictable climate. By 1980, over a third of the people in the industrial nations of the west were living at or near the survival level--ill-housed, ill-clad, ill-fed--dependent on a malfunctioning corporate economy, and clinging to fading hopes of a return to "prosperity." However, growing numbers of people, convinced that the old order was past recall, opted for a frugal lifestyle. Individually or in groups they sought to develop less complex, more independent, and self-sustaining economic alternatives. Goals of affluence and conspicuous consumption were eschewed in favor of personal and spiritual growth, independence, and self-sufficiency.

It was the growth of this frugal sector that led to some improvements in the 1980s. As more and more people adopted the frugal lifestyle the pressures on the industrial economy were diminished, allowing some room for adaptation. By 1990, the improvement was not marked so much by a higher material standard of living as by a growing acceptance of lower levels of consumption--accompanied by a higher overall quality of life, at least for some. Also by 1990, the agricultural system had adapted to the vagaries of the climate. Although shortages became a way of life, they were eased somewhat by the "grow your own" movement in urban areas and more labor intensive, "production for use" agriculture in rural areas.

Even as the situation was just getting in hand, the weather began to turn for the worse in 1990. Levels of energy consumption for heating and producing and transporting food rose rapidly. With many of the institutions of industrial civilization no longer in place, the general state of affairs deteriorated rapidly as there was an inability to mount the heroic efforts necessary to cope with this turn for the worse.

Individual Aspects

An incremental series of failures tested the limits of man's adaptability. Between the late 1970s and the mid-1980s, there was a shake-out of both systems and people--finally reaching a depressed level which was to endure virtually unchanged for the next decade and a half. The proportion of the population in the achievement sector shifted from a majority to a quarter of the population. This power elite controlled the government, economy, military, and knowledge sectors of a society battered both by internal and external forces. The achievement sector could not maintain its relative affluence, however, without the simultaneous existence of an industrial/feudal class--the survival sector. The survival sector tolerated material deprivation knowing that if they acquiesced, their physical maintenance would at least be assured during a time when the struggle for subsistence had reemerged as a stark reality.

The survival sector felt neither spiritually compelled nor physically able to cope with the rigors of the frugal life. The frugal folks were literally dropouts from the society; most lived apart from the formal economy in relative isolation and gradually developed both a technological and institutional structure which allowed them to explore and validate their "frugal-unfolding" lifestyle. The hope of renewed affluence and the uncertainty of a frugal existence prevented any significant shift of survival persons into the frugal sector. The frugal sector was tolerated as "separate and unequal"--partly because they did not impinge greatly upon the larger society and partly because they did not have the means or the desire to threaten the position of the achievement elite.

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Individual Aspects

1980	1990	2000
rationalistic/instinctive →	rationalistic/instinctive/ intuitive →	→
adaptive →	adaptive/rigid →	→
frugal/moderated conspicuous consumption →	→	→
immature →	adolescence →	→
pragmatic →	pragmatic/idealistic →	→
secular →	secular/spiritual →	→
materialistic →	materialistic/non-materialistic →	→
competitive →	competitive/cooperative →	→
industrial image of man →	industrial/humanistic image of man split →	→
valuing present generations →	→	→
self-interest →	self-interest/small group interest →	→
watershed →	watershed/Epoch B →	→
little ecological concern on large scale →	→	→
science response mode →	science/wisdom →	→
cyclical →	cyclical/evolutionary →	→

The frugal sector was thus an "escape valve" which facilitated the growth of an increasingly rigid, bureaucratized, "friendly fascist" dominant sector.

Social Systems

Despite a determined effort through more than two decades, this scenario concluded around 2000 with a situation in which the bleak visions of Robert Heilbroner, Paul Ehrlich, and Harry Brown were at least partially fulfilled. The stubbornness with which the industrial nations, especially the western ones, maintained their faith in the viability of their major institutions was amazing if only because there were so few and such small successes to offset the steady sequence of failures and dashed hopes.

This was an intensely rational period at first. It became clear in the mid-1970s that the political and economic balance of the post-World War II world had changed and was changing irrevocably to the disadvantage of the so-called free world of the industrial nations and their third world dependencies. Thus national planning agencies in the United States, Europe, and Japan--at first independently but increasingly on a coordinated and cooperative basis--developed programs of austerity designed to hold their systems together pending the technological breakthroughs that would provide new sources of energy and restore growth to their economies. Vast amounts of capital supported by very high taxes went into these programs. Enormous political skill was shown in motivating populations to save, sacrifice, and defer gratification. Similarly, great diplomatic finesse was displayed both in coordinating the mutually supporting efforts of friends and allies and in avoiding costly competition with possibly hostile nations. Very importantly, increasing numbers of people were urged to and learned to supplement with their own efforts the reduced goods and services provided by corporations and governments.

The increased adaptiveness and ingenuity developed by many individuals led to a growth in the numbers adopting a frugal ethic even while most did so in the name of supporting the achievement ethic. Since full employment--at lowered wages and in government makework programs--was maintained, an equal number of people were unwittingly conditioned in the survivor ethic. Thus, despite the appearance of high consensus and homogeneity throughout those dogged decades, society was actually becoming more heterogeneous and the commitment to the controls applied from the top was weakening. Also, a formally rigid society was actually becoming increasingly adaptive. On the one hand, frugals developed satisfactory alternative lifestyles that allowed them to escape the effects of the rules. On the other, survivors hustled, black marketed, and managed to beat the system. Thus within a highly collectivized system a wide range of individual styles became visible. As the 90s wore on, fewer and fewer people had any real commitment to the achiever program. Officially programmed activities became sterile and failed to succeed enough to sustain the faith. What was originally rational became irrational, and a determination to succeed became compulsive pursuit of the impossible.

What tipped the balance was the impact of the bad weather cycle of the 90s. Cold weather and food shortages caused abandonment of controls on fuels. Central authority everywhere tended to break down. International agreements were abandoned, and not amicably, as the various nations accused each other of violations. The erstwhile passengers on spaceship Earth took to their individual lifeboats and drifted away from each other in an increasingly cold and dark climate.

SCENARIO 8

Social Systems

1980	1990	2000
pluralist world		→
nation-state →	international order →	nation-state
rational over irrational →		irrational
internal heterogeneity		→
high over low consensus →		low consensus
spaceship ethic →		lifeboat
rigid →		adaptive
collectivist/individualistic		→
active/passive		→
responsive		→
mature →		immature
slow change →		rapid
hard change		→
systems malfunction		→
centralization →		decentralization
technocratic/humanistic ethic →		lacking a clear ethic
discontinuous →	continuous →	discontinuous

The more favored regions, where alternative economies based on "small is beautiful" had been built up imperceptibly by frugals, began to adopt policies of "caring for our own." Obstacles to geographic mobility of people were erected in defiance of weakening central authority.

Just as the shift to a controlled and centralized economy in the 70s and early 80s had been rapid, so was the turn to decentralization. Even more sudden was the abandonment of faith in science and technology and the corollary commitment to universal humane idealism. Big science, big technology had failed; the vision of a renewed march toward affluence for all became a mockery. Frugals, in a variety of societal forms, lived in islands of relative prosperity in favored regions. Survivors, almost equal in number, formed a vast urban and rural proletariat living in an Appalachia-like poverty culture marked by debased versions of traditional forms.

Productive Systems

By 2000 the United States (and to a lesser degree the Western European nations) split into two societies. Half the population was engaged in the maintenance of the old, depressed industrial economy--either as achievers who ran it and profited from it or as survivors who worked for achievers or were maintained as dependents on bare subsistence levels. The other half, the frugal sector, sought to maintain themselves in alternative self-sustaining economies that gave no greater material reward but offered at least a sense of greater independence.

The leaders of the industrial nations had promised that the slowdown and consequent recession of the late 1970s would be only a temporary halt on the triumphant march toward progress and affluence. They failed to deliver. The recession developed into depression at least partly because the new energy sources demanded for recovery did not come into use.

SCENARIO 8

Productive Systems

1980	1990	2000
production for use/profit	use	use/profit
fragmenting industry		fragmented/some reconcentration
industrial	non-industrial	non-industrial/industrial
slowly declining GNP		
static equilibrium		dynamic equilibrium
differential income distribution	equalizing	some differential
government regulation of corporations		government/frequent violations
diminished faith in science and technology		
toward a knowledge mass		
ineffective use of existing technology		
information base	wisdom	wisdom/information
slow population growth		stabilizing
perceived resource scarcity		

Although discredited, the elites retained national political authority. The potential leaders in the frugal sector concentrated on the needs of their own communities. They gained political influence but sought neither control nor responsibility. Basically, they supported the achiever elite in its national policy on the condition that they would be granted a large degree of autonomy in their own affairs and protected from the unlawful elements among the survivors.

The worsening weather of the 1990s undermined the prestige of both the achievers and the frugals whose nascent economic recovery was effectively halted. The achiever elite became even more firmly entrenched in power than before, because they had the greater ability to control such resources of fuel and other basic commodities as were available and to fund the basic communications networks. However, while responding to the worst aspects of the situation, they showed no signs of being able to resolve the major crisis of the depression. It was evident that things could not get much worse without some new approach being tried, but what that approach might be was by no means clear.

Ecosystems

This scenario presents a society which by the year 2000 was confused, fragmented, and impotent with respect to environmental and ecological problems and policies. The prevailing mind-set recognized that man is part of nature and therefore subject to those principles which govern nature, but he had not learned to make those principles effectively work for his society. There was an awareness of the systemic quality of things and the distinction between differentiated and undifferentiated growth was understood; however, society itself was not operating in a positive, holistic manner. While the frugal sector dominated in numbers, there was a significant number of old-order achievers who resisted the frugal paradigm.

The worsening climate and resulting food shortages lent credence to the lifestyle of the frugals; however, the willing acceptance which comes with a true shift in values was not present. The frugality was by default, not conviction.

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Ecosystems

1980	1990	2000
man in nature	→	man in nature/ man over nature
critical threshold recognized	→	→
increasing environmental preservation	→	→
resilient environment	→	→
systems view	→	discrete/systems view
differentiated growth recognized	→	→
multiple order consequences recognized but not planned for	→	→
action without urgency	→	→

From the Literature

The U.S. economy is expected to increasingly confront the problem of "limits to growth" and the impediments engendered by the behavioral properties of large complex systems which tend toward conditions of low performance.

Center for the Study of Social Policy,
Changing Images of Man, Stanford
Research Institute

Science and technology have given man immense power. However, our ability to control that power has not developed apace. Further, people have not been made happier or more content by the advance of science and technology.

Robert Heilbroner, *An Inquiry Into
the Human Prospect*

The environmental effects, particularly climatic changes, induced by the production and consumption of energy and extraction of resources place an upper limit on industrial growth.

Robert Heilbroner, *An Inquiry Into
the Human Prospect*

The number and importance of communes or other nontraditional forms of social and economic organization will increase in a future in which cultural pluralism and experimentation will have a high degree of importance.

Dennis Gabor, *The Mature Society*

While politics and government are less emphasized, there is greater participation in the political process by the citizens as increasing control is passed on to the neighborhood and regional councils which make decisions affecting the daily lives of the people.

Pacific House Associates, *An Organized
Look at the Future*

The struggle over ownership and use of world resources is a primary factor affecting foreign relations.

Center for the Study of Social Policy,
Changing Images of Man,
Stanford Research Institute

The possibility of severe food shortages and famine in the lesser developed countries is relatively high.

Dennis Gabor, *The Mature Society*

As the hungry masses stream from the countryside into urban centers, there will come a collapse or near collapse of those centers.

Robert Heilbroner, *An Inquiry Into the Human Prospect*

International relations are tense among the great powers who will continue to compete with one another for military and economic advantage. However, the sense of vulnerability vis-à-vis each other will tend to prevent the outbreak of nuclear/biological/chemical war.

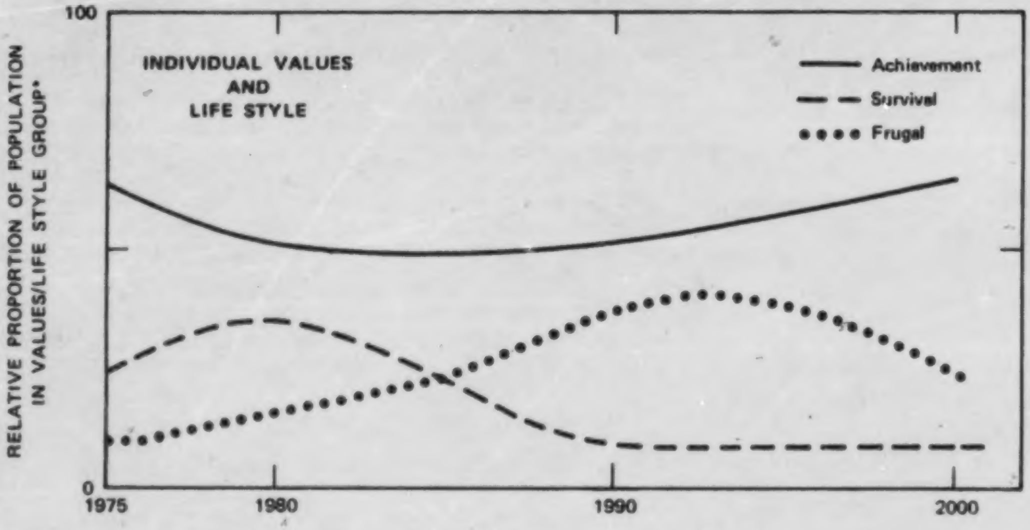
Dennis Gabor, *The Mature Society*

SCENARIO 9

"MATURE CALM"

Summary

Even in the 1970's many people realized the need to control growth or even limit it. The period from 1975 to 2000 was a time of learning how to do that task well. The results of inept control in the late 1970's were so bad—a deep and extended recession—that very large numbers of people just gave up on the system and opted out, seeking their own self-sufficient way of life. Aided by the need to provide for fewer numbers and an improving climate, the social managers of the late 1980's and early 1990's finally got the situation in hand. They were so successful that by 2000 many of the dropouts returned to the fold.



	1980	1990	2000
ENERGY	controlled growth	controlled growth	controlled growth
CLIMATE	variable	favorable	favorable
FOOD	high price, no shortage	high price, no shortage	high price, no shortage

Driving Trends

The heart of this scenario is the struggle over how to best manage a complex society. The central issue in this struggle is the use and production of energy. Attempts to control the exponential growth of energy consumption in the late 1970s were not very successful. While growth was indeed slowed, the negative consequences were severe, particularly in terms of the economy and jobs. This unhappy situation was exacerbated by an unpredictable and unreliable climate.

The improving climate of the 80s as well as the increasing shift of large numbers of people toward a more frugal way of life facilitated the efforts to manage energy more carefully. Some of these frugal folks had left the energy-intensive economy altogether, while the others were placing lower demands on it. Thus by 1990 the situation was well in hand. The final decade of the century was a period of slowly rising affluence. Now that the energy situation had been resolved, many of those who had adopted the frugal path out of a sense of necessity were again seeking a higher material standard of living.

Individual Aspects

This future opened with many persons holding values consistent with the long term multifold trend, but external circumstances brought those values into question in the late 1970s. Consequently, throughout the 1980s, there was a growing split between two social sectors: the achievement/survival group on the one hand and the frugal sector on the other.

The frugals achieved substantial success in the 1980s as they drew significant numbers of people from the survival sector. When the 1990s opened, it appeared that either sector might dominate society during the decade. One thing was clear: the society could not sustain two such dissonant sectors for long. The achievers were pushed by economic

SCENARIO 9

Individual Aspects

1980	1990	2000
rationalistic	rationalistic/intuitive	rationalistic
rigid	adaptive	
passive	active	
conspicuous consumption	maintenance/frugality	conspicuous consumption
immature	adolescence	mature
materialistic	materialistic/non-materialistic	materialistic
secular	secular/spiritual	secular
pragmatic	pragmatic/idealistic	pragmatic
competitive	competitive/cooperative	limited competition
value present generation	valuing future generations	valuing present/future
need for new image of man		mature industrial image of man
watershed	Epoch B/Epoch A	Epoch A regained
diminished ecological concern	taoistic/physical	physical ecology
science response mode	science/wisdom	science dominates
anticipatory action		
cyclical	cyclical/evolutionary	cyclical predominates

necessity and pulled by the compelling image of man espoused by the frugal group. They reacted by co-opting the frugal sector and by translating their good ideas and values into a form palatable to the achievement sector. Enough of the marginal frugal folks were drawn off to shift the balance of population/values toward the achievement sector. Having the flow of history with them and in control of the media the achievers recaptured the momentum. As the year 2000 came around, the frugal sector rapidly diminished and continued to be assimilated by the mature industrial-state paradigm of the achievement sector.

Social Systems

There was a relatively smooth transition to a Druckerian post-industrial future by the year 2000. However, this future by no means displayed the super affluence envisioned by Herman Kahn. Indeed, one can envision Daniel Bell and Dennis Gabor existing quite happily during almost every year of the whole period. Gabor's faith in mature and rational man was confirmed; Bell's vision of the end of ideological dispute became real.

The world order was far more homogeneous than pluralist and grew more so throughout the period. Birthrates stabilized worldwide at bare replacement levels and while there were, to be sure, rich and poor nations, in all of them a modernized middle class became prominent and set the tone and style of society. These middle classes were linked through the multinational corporate network that, through the joint venture organization, extended even into the East European communist countries. International labor unions provided a similar although less extensive and less effective means for multinational employees to achieve roughly equivalent consumption standards and lifestyles. In Africa, on the Indian subcontinent, in the Caribbean, and parts of Southeast Asia, a large rural underclass continued to exist outside the system, with birth limitation programs and controls on urban immigration tending to insulate the modern sectors from their intrusions. Only China and the communist portions of South and East Asia remain aloof. Even they increased trade relations, an indication that the process of homogenization was irresistible.

Increasingly the utility of the nation-state and its emotional holding power diminished. By 1990, most nations dealt internationally through regional confederations. The seas and their resources were completely internationalized under United Nations control and national surface navies disbanded. The experience of regionalization contributed to further dissipation of the nationalist ethic so that by 2000 the prospect of actual world government--at least for the purpose of providing policy guidance to the national and regional confederations and for administering the rules of international trade--was viewed as imminent, inevitable, and desirable.

Although the period 1975-1980 was one of disappointed hopes for technological breakthrough in the energy area and was marked by a sluggish and recessive economy in the United States and elsewhere, there was never any suggestion of collapse or real fear that it might occur. Politicians who talked of the need to get their countries moving again were credible, not ridiculous. The atmosphere in the United States was one of sober rationality. Failures were taken in stride; goals were limited and realistic. From 1980 onward the number of people who adopted frugal values increased. A renewed period of good climatic conditions worldwide allowed the utilization of formerly marginal agricultural land, and there was a visible back-to-the-farm movement by both individuals and cooperative or communal groups. Within the United States, a revived CCC-type program allowed the recruitment of many youthful unemployed for the reclamation of land. A variant of the same program for inner cities employed many in a vast program of urban reconstruction.

These programs, which offered both employment and the opportunity for learning self-support skills, were successful and helped to shrink the ranks of passive survivors. These and other programs sponsored by government and corporations (as distinct from the self-help, voluntary activities typical of frugals) also provided scope for those clinging to achiever values, since it was from the government bureaucracy and corporate executive ranks that the planners and administrators were drawn.

While the growing ranks of the frugals produced a variety of lifestyles--diverse forms of family organization, distinctive dress and diet, rituals, architectural forms, literature and entertainments--that allowed them to be distinguished at a glance from the achievers who clung more or less tenaciously to the norms of the straight society of the 1970s, both groups shared more concepts than they held differing ones. Even by 1990, when American society was almost evenly split between the two groups, they were both committed to individual human dignity, awareness of the finitude of resources and the need for preservation of the biosphere, faith in the rational process, insistence on peace between nations and domestic law and order. Their essential difference was the frugal acceptance of a stable economy in which concentration was on qualitative growth versus the achiever faith that a "normal" technology based, industrial growth economy had to be restored.

The 1990s were a time of coalescing of the two groups. Increasingly, those who passed through the frugal experience, or their children, returned to the achiever ranks and, rather like practical Quakers, built careers in the restored but more temperate industrial economy without, however, abandoning altogether the remnants of the frugal ethic. Indeed, the new generations of achievers were as much influenced by the frugals as they were by the older achievers. This was a tolerant, assured and, in the Gaborian sense, a mature generation.

SCENARIO 9

Social Systems

1980	1990	2000
pluralist world →		
nation-state over international order →	nation-state equal to international order →	international order equal to nation-state
rational →		
internal heterogeneity →	homogeneity →	
low consensus →	high/low →	high consensus
lifeboat ethic →	territorial →	scientific spaceship
rigidly adaptive →		
elite control →		individual elite dominating a collective mass
active →		
immature →		maturing
slow, gradual change →		
difficult change →	easier change →	
minor systems disruptions →	system continuity →	
centralization →	some decentralization →	centralization
technocratic ethic →		technocratic/humanistic merger
continuous →		

Change was relatively slow during this quarter century, but continuous. Looking back from 2000, people were astonished at how much change there had been. There was a sense of accomplishment but no smugness. There was a determination to hold onto the gains that had been made and to make more, but an even greater determination not to permit uncontrolled expansion or runaway technology to dominate the life of the society.

Productive Systems

This scenario is the tale of sophisticated scientific managers first coping with and then adjusting a complex society to the realities of a finite earth. They slowly changed the primary motivation of corporations from maximizing profit to producing for useful purposes while still making a profit. The giant corporations made the transition and survived, although the late 70s in particular was a very difficult period for them as the shocks of reduced energy consumption hit many of them hard, especially the auto industry. During the 80s, a good deal of the productive capacity of the country was found in small decentralized enterprises, many of which persisted on into the year 2000. However, the 90s also was a period of resurgence for the large corporations, which were controlled by a technocratic elite. The nearly two decades of intense government regulation of private enterprise came to an end in 2000 as the new managers increasingly took on responsibility for self-regulation.

In the near term, an unintentional damper was placed upon economic growth in the form of a prolonged recession. Then, in the late 1980s, energy and economic growth continued to be controlled, but this time by intentional design. By the year 2000, the economy seemed headed toward a dynamic equilibrium state, although there was still considerable debate over whether this was actually possible. As the nation became in a sense more self-controlled, the perception of resource scarcity in the

SCENARIO 9

Productive Systems

1980	1990	2000
production for profit →	profit/use →	→
economic concentration →	some fragmentation →	increasing concentration
government regulation →		elite self-regulation
continued faith in science and technology →		→
knowledge elite →	knowledge mass →	information elite
moderate GNP growth →		tending toward dynamic equilibrium
perceived scarcity →		perceived sufficiency
information base →	information/wisdom →	information
slow population growth →		stabilizing
significant income differential →	equalizing →	differential
increasing globalization →		→
need for new technology →	effective use of existing technology →	→

70s gave way to a feeling of sufficiency, allowing a growing globalization of all aspects of social enterprise.

Ecosystems

With respect to ecosystems and the environment, this scenario presents one of the least disruptive and most continuous progressions through the period 1980-2000. Society's view of nature and its concern for the physical environment changed in degree but not kind. An appreciation of systems and of the concept of differentiated growth became a part of man's thinking as early as 1980. By the turn of the century, society was successfully using these concepts to manage the environment.

The predominant view continued to hold that man is apart from and destined to control nature. While the growth of the frugal sector during the 1980s did much to modify this view, few people outside of this sector felt a true equality or oneness with nature.

Although the environment suffered during the troublesome early 1980s, it was never subject to severe disruption. The understanding of ecosystems and the successful control of growth in later years prevented this.

SCENARIO 9

Ecosystems

1980	1990	2000
man over nature →	man over nature/ nature over man →	man over nature
no critical threshold recognized →		
increasing environmental concern →		managed environment
discrete view →	systems view →	
undifferentiated growth →		differentiated growth
first order consequences →		multiple order consequences
action not urgent →	action becomes urgent →	action less urgent

From the Literature

Consistent with other descriptors in this scenario, government influence and regulation of private enterprise increased until the mid-1990s, when a redefinition of that relationship emerged in the form of a balance between the two sectors. This balance is maintained by new principles of management organization with minimal government intervention.

Pacific House Associates, An Organized Look at the Future (I).

American economic health depends now and will continue to depend on organization of and support for the production of new knowledge and its export to other countries.

The other major U.S. economic advantage lies in its superior knowledge of management and organizational techniques. Application of these techniques to the management of multinational corporations, will continue to be the main determinant of a healthy American economy.

Peter Drucker, The Age of Discontinuity: Guidelines to Our Changing Society.

The abdication of power in international politics and the abandonment of overseas military bases signal a general decline in the cold war. Traditional alliances tend to disintegrate in the wake of widespread support for international bodies.

Arnold Mitchell, Life Ways and Life Styles, Stanford Research Institute.

More and more the function of international relations will be the establishment of appropriate rules for the free play of the private multinational corporations as they develop the "global marketplace" and provide the impetus for development within the poorer countries.

Peter Drucker, The Age of Discontinuity: Guidelines to Our Changing Society.

The ideological quarrel between "capitalism" and "socialism" disappears in the bureaucratization of both.

The multinational corporations increasingly bind the whole world into an interdependent economic unit. The developed nations which serve as their headquarters specialize in knowledge creation and knowledge processing, while the production of standardized goods is carried out within the lesser developed countries.

Daniel Bell, The Coming of the Post-Industrial Society.

Science is increasingly bureaucratized and manages to meet the communally expressed goals of society. More and more people are employed as scientists and technicians. However, the attention of science is given more to the management of externalities, the recycling of wastes, and the increase of productivity than it is to the development of new products.

Daniel Bell, The Coming of the Post-Industrial Society.

The developed countries will be more and more willing to submit to regulation by government agencies in the interest of preserving the environment.

Dennis Gabor, The Mature Society.

The predominant attitude toward the environment is one of pragmatic conservation. A deep and genuine concern for the environment is weighed against the benefits to be derived by use of its resources, and a workable balance is struck. Essential to establishing and maintaining this balance is a new attitude toward reduced material consumption and the development of new materials technology.

Pacific House Associates, An Organized Look at the Future (I).

The emphasis is no longer on how to cope with change, but rather on how to organize in order to most effectively manage the change process. Nongovernment institutions meet this challenge by disaggregating management, thereby reducing control functions into more workable components. This permits any given function to be placed at the appropriate level of control and ensures democratic participation by all members of the organization in the goal setting and progress evaluation processes.

Pacific House Associates, An Organized Look at the Future (I).

Improvements have resulted not from some grand design but from a society responding to particular issues and crises, finding the will and the way to do what it reluctantly agreed must be done. After a period of near collapse the society has begun to coalesce, a new sense of optimism is prevalent, and the earlier trend of withdrawal into a closed, personal space has been reversed.

Pacific House Associates, An Organized Look at the Future (II).

The number and importance of communes or other nontraditional forms of social and economic organization will increase in a future in which cultural pluralism and experimentation will have a high degree of importance.

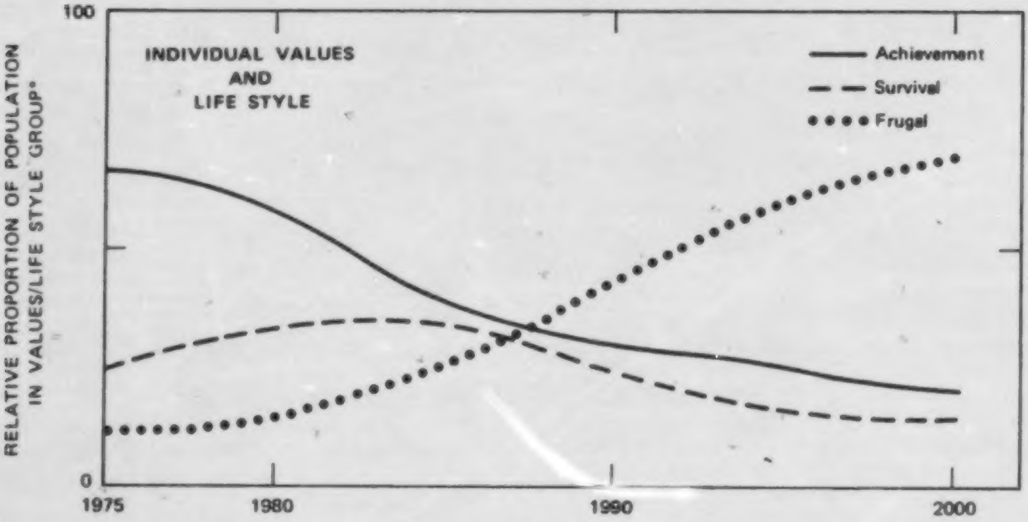
Dennis Gabor, The Mature Society.

SCENARIO 10

"TOWARD THE JEFFERSONIAN IDEAL"

Summary

A rapid evolution in values leads to a transformed America by the year 2000. More and more people came to realize the necessity of tempering our desire for affluence with an appreciation for the limits of the earth and the needs of its people. The process of transformation was not without some disarray, particularly in the late 1970's and early 1980's, when there was little consensus on how to control growth, let alone whether it was desirable to do so. However, from the mid-1980's on, both the ability and the will to manage growth carefully increased.



	1980	1990	2000
ENERGY	controlled growth	controlled growth	zero or declining growth
CLIMATE	variable	favorable	variable
FOOD	high price, no shortage	high price, no shortage	high price, no shortage

Driving Trends

A fairly rapid shift in American values is the essential driving force in this scenario. The shift was manifested in the nation's energy policy and the climatic situation. Attempts in the late 1970s and early 1980s to control energy consumption were not very successful owing to a wide split in values, with consequent low consensus, and to the variable climate.

The 1980s and early 1990s was a period of improving climate and increasing ability to manage the growth in energy consumption as a growing number of people opted for a more frugal way of life. This success led to a rapid growth in that sector so that the frugals were dominant by the year 2000. The shift in values also led toward a zero energy growth trend by the turn of the century.

Individual Aspects

The scenario opened with a majority of individuals holding values consistent with the long term multi-fold trend. These strongly held and historically successful values were, however, being rapidly undermined by a deteriorating economic condition. Consequently, an increasing proportion of the population began to experiment with new values and life-styles which offered hope under conditions of "new scarcity"--this is the so-called frugal sector. The frugals traded exterior/economic growth for a new form of growth--psycho/social/spiritual growth--searching for voluntary simplicity in the exterior aspects of their lives in order to achieve greater abundance in the interior life. To achieve outward simplicity they discarded (or did not buy) possessions and did not engage in activities which seemed irrelevant to their main purpose, which was to explore, in community with others, their higher human potentials. Given the new scarcity which compelled people to live more frugally, the

SCENARIO 10

Individual Aspects

1980 1990 2000

secular → secular/spiritual →
competitive → competitive/cooperative
consumption ethic → frugal ethic
decreasing rigidity → increasingly adaptive
rationalistic → rationalistic/intuitive
industrial image of man → new "frugal/unfolding" image
self-interest → self/social interest
Epoch A → watershed → Epoch B
benign neglect of environment → physical ecology → taoistic ecology

exterior simplicity and interior richness of their lives seemed a very rational and appropriate response to a pressing situation.

Persons in the achievement and the survival sectors were likewise pushed by economic necessity and pulled by what seemed to be a desirable and humane way to live toward emulating or joining the frugals. The move towards voluntary simplicity/inner unfolding then took the form of a cultural imperative. Consequently, by the early- to mid-1980s, large numbers of people began to adopt this way of life and corresponding lifestyles. The movement continued with increasing momentum, confidence, and assurance as institutions, policies, and technologies were adapted to make it a self-fulfilling future. By the close of the century, the survival and achievement sectors had not altogether vanished, but the power clearly lay with a new generation of leadership and a new majority which, to varying degrees, had assumed the frugal constellation of values.

Social Systems

Through the period 1980 to 2000 there was very rapid yet smooth and continuous change in social systems in the United States and the rest of the industrialized world toward a state which resembles the "greening" popularized by Charles Reich in The Greening of America and discussed by Dennis Gabor in The Mature Society.

People showed an enormous resilience as they realized by the early 1980s that there would not be a return to the wide-open economic growth that characterized the heyday of industrialization. Increasingly, political and business leadership in the United States and Western Europe came to accept that diplomacy, armed force, and economic organization would not make an homogeneous world-order responsive to their control and direction. They adjusted to a pluralist world order and, within the western democracies, at least, to a pluralist society as well.

Consistent with this process of adjustment, the nation-state remained the primary political and emotional unit in international affairs. However, there was at the same time a strong commitment to international peace and order which progressively was expressed in the subordination of perceived national interests to world interests. It was discovered that spaceship Earth can function without centralized and hierarchical direction, provided that all the passengers and crew agreed to avoid actions which would produce malfunction. This agreement was based on mutual respect and awareness of the need for some minimum level of interdependence.

The determination to avoid a "tragedy of the commons" required recognition both within countries and internationally that nations in fact share a commons. Once consensus was reached on this vital point, much of the social rigidity connected with concepts of mastery over nature and of private property rights tended to dissipate. The inevitable need for regulation of use of the commons required a degree of centralization of authority and centralized control of socially significant resources. However, since such authority was more and more based on a social consensus, there was less tendency for individuals or institutions to challenge the authority and press against its limits. Thus, in what appears a slight paradox, a large degree of subordination of private interests to the collective good of society coexisted with a highly individualistic society. (This was chiefly true of democratic societies. Other mechanisms were at work in other types of societies where individualism and pluralism were not so highly valued.)

Another important social characteristic was the high degree of activism. In the face of the disappointments felt through failure of the efforts of the late 1970s and early 1980s to resume the long term multifold trend, more and more people learned to cope and regained a sense of control over their lives. A visible minority strove to become economically self-sufficient either alone or in communes; more people demanded a voice in the management of more traditional economic enterprises. Both groups formed a confident citizenry, skeptical of "experts," and became in every way more resilient and self-reliant. This was definitely a mature society in which the principle of "consenting adults" applied in almost every sphere of living.

As the achievement sector diminished in importance, the trend to urbanization was reversed. The relatively self-sufficient small town and city gained renewed importance. Many of the farm communities that had declined during the mid-twentieth century revived, but increasingly displayed features of the European agricultural village rather than the American farm town. Most of the frugals who went back to the land during this period adapted industrial division-of-labor techniques both to farming and the integrated low-technology industries and services of the farm towns. Frequently, they designated their enterprises as companies or corporations and employed participative techniques of democratic industrial management. Others, more frankly modeling themselves on Hutterite or other communal agricultural communities, called their towns and their enterprises communes, collectives, or cooperatives. While there was considerable experimentation with a variety of basic social forms, the extended biological family tended to predominate.

To a lesser but still marked degree participative management became the dominant mode in the diminished traditional sector of corporate business and nationwide and regional services on which the decentralized network of towns and cities relied. This, in turn, was mirrored in government practice which increasingly was "federalized," with the national and state governments becoming of less importance as directors and controllers than as resource centers and communications exchanges.

SCENARIO 10

Social Systems

1980	1990	2000
pluralist world →	→	→
nation-state over international order →	nation-state/ international order →	international order over nation-state
rational social behavior →	→	→
internal heterogeneity →	heterogeneity/ homogeneity →	→
low consensus →	high consensus →	→
territorial ethic →	territorial/spaceship →	spaceship ethic
adaptive/rigid →	adaptive →	→
individualistic over collectivist →	→	→
passive/active →	active →	→
immature →	mature →	→
rapid, easy change →	→	→
systems continuity →	→	→
decentralization →	→	selective centralization
technocratic ethic →	→	humanistic ethic

By the old economic rules, this was not throughout a period which one could call successful. However, survival with self-respect intact became itself the measure of success--and came to be preferred to affluence at the expense of self-respect. The failure of high technology to make good its promises during the early years of the period produced initially a nearly universal discrediting of science. However, as more people became individually involved in the productive process and aware of the potential for a human-scale science that could be controlled instead of controlling society, there was a resurgence of scientific activity along the lines endorsed by E. F. Schumacher in Small Is Beautiful.

Productive Systems

After a period of net decline in the late 70s and early 80s, the GNP showed modest growth through the early 90s, then began to level out toward a dynamic equilibrium. Some sectors of the economy grew while others remained stable or declined. The two major components of this change were the evolution of production for use rather than for profit (although profit remained one motive) and the increasing fragmentation of industry. The giant corporations gave way to smaller enterprises as the economy was slowly decentralized. Over the two-decade span, the disparity in income distribution evident in the 1970s narrowed considerably. As a whole, the economy was moving from the industrial toward the post-industrial, although in the year 2000 the final shape of that post-industrial model remained unclear.

The extensive investment in the development of new technology in the late 70s permitted in 2000 a much greater attention to effective application of existing technology. The great value placed on sophisticated high technology by the mid-century society gave way to a much greater emphasis on intermediate technology. This was reflected in the increasing level of education of the populace in general and the broader participation in

SCENARIO 10

Productive Systems

1980	1990	2000
production for profit →		production for use
economic concentration →		fragmentation
diminishing high technology →		increasing intermediate technology
industrial →		post-industrial
knowledge elite →		knowledge mass
net decline in GNP →	modest GNP growth →	dynamic equilibrium GNP
perceived resource scarcity →		perceived sufficiency
information base →		information/wisdom base
slow population growth →		stabilizing population
differential income distribution →		equalizing income
emphasis on new technological development →		emphasis on effective use of existing technology

knowledge-related activities. In a similar vein, the nature of information itself evolved from information based on data to information enhanced by wisdom.

The slowly declining birthrate slightly offset an increasing life span that was due to a cleaner environment and better health care. Thus, by the year 2000, population stabilization was near.

Ecosystems

In place of the consumptive, exploitative attitude of 1975, man gradually adopted the taoistic world view of man with nature.

As the frugal sector grew so did the recognition of the intrinsic worth of the physical environment. This new appreciation evolved from the earlier view which acknowledged the worth of the environment but only to the extent that it was needed by man to ensure the happiness and survival of future generations. By the year 2000, lower levels of consumption combined with the emerging intermediate technology enabled the environment to return toward its original balance.

When the frugal sector became dominant, an appreciation for the interdependent, interactive nature of systems became increasingly internalized within society. Social and political leaders recognized the distinction between differentiated and undifferentiated growth and reflected this awareness in their policy decisions. There was also a significant effort to anticipate third and fourth order consequences of these decisions.

SCENARIO 10

Ecosystems

1980 1990 2000

man over nature → man with nature

environmental conservation → environmental preservation

discrete view → systems view

undifferentiated growth → differentiated growth

first order consequences → multiple order consequences

action urgent →

From the Literature

A new paradigm is needed which emphasizes a shift from consumption to conservation along with a redefinition of the "planned" (public) and "free" (private) segments of the economy.

Dennis Pirages and Paul Ehrlich, Ark II.

Consistent with other descriptors in this scenario, government influence and regulation of private enterprise increased until the mid-1990s, when a redefinition of that relationship emerged in the form of a balance between the two sectors. This balance is maintained by new principles of management organization with minimal government intervention.

Pacific House Associates, An Organized Look at the Future (I).

In the long run, when all important factors are accounted for and the long-range benefits considered, cooperation is the only sensible and the most beneficial path for all participants.

M. Mesarovic and E. Pestel, Mankind at the Turning Point.

As the country begins to adjust to the arrival of the post-industrial state and adopt new values accordingly, there emerges new governing criteria based more on collective interests and less on private aims than before. Government assumes an expanded social role, and provides for major safety and security needs.

Arnold Mitchell, Stanford Research Institute, Life Ways and Life Styles.

Technology is not inherently bad; rather, it is the primary source of salvation for our many societal ills. Appropriate technology--that which is more conserving/simpler/frugal/approachable--will be essential, however, for building a transformed and humanistic society.

Center for the Study of Social Policy, Changing Images of Man, Stanford Research Institute.

IV POLICY METHODOLOGY

Given a range of alternative futures, how does one find out what they mean for policy? To answer this question required the development of a methodology that would allow the systematic exploration of the policy implications of these futures for the client--EPA.

The methodology we used was divided into a development and an analysis phase. The development phase had three steps: development of policy factors, development of policy issues, and development of a policy issue/scenario matrix. The analysis phase also had three steps: cross-scenario analysis, cross-issue analysis, and policy reversal analysis. The methodology of each phase is discussed below.

Development Methodology

Policy Factors

In consultation with the Office of Pesticide Programs (OPP), we developed a list of factors affecting OPP policy decisions. This was not intended to be an exhaustive list of all factors but rather to illustrate the kind and range of considerations that must be juggled and balanced in the policymaking process. An example of such a policy dimension is: a concern for health risks, recognizing that tolerances on pesticide residues must be set to protect consumers' safety but at the same time taking into account that the levels set have an influence on food costs and other factors.

Policy Issues

The policy factors developed above were still too general to allow a focused assessment of the contrasting policy implications that would emerge by looking at policy concerns across scenarios. Therefore, it was necessary to translate these into specific policy questions. A series of 16 policy issues that represented most of the policy dimensions outlined by OPP were developed. These are shown on page 163. These 16 issues were framed in terms of public attitudes under the assumption that EPA/OPP would make policy decisions generally in keeping with prevailing public attitudes. Each issue was stated in such a way that it could be answered by a "more/less" or "increasing/decreasing" response. For example, the policy issue, "The degree to which people consider future risks to their health important," could be answered by discerning an increase or decrease relative to the present. This seemed a useful mode of analysis because it provides a common symbolic description across many scenarios and many policy issues. These increases/decreases were represented by arrows.

Substantial increase	↑↑
Moderate increase	↑
No change from present	↔
Moderate decrease	↓
Substantial decrease	↓↓

Thus, in assessing the direction and degree of change in public attitudes for a specific policy issue (such as support for environmental regulation) in the context of a given scenario, we contrasted the most reasonable response for the issue at a future time with our perception of present attitudes toward that issue. Thus, we would reach a consensus;

POLICY ISSUES*

Issue	Definition
1	The degree to which people will not tolerate involuntarily assumed health risks (e.g., pesticides as opposed to cigarettes).
2	The degree to which people consider future risks to their health important (e.g., risk of illness ten years hence as a result of present actions).
3	The degree to which people have attitudes that do not tolerate degradation of the physical environment.
4	The degree to which prevailing conditions provide incentives for innovation in new pest control methods.
5	The degree to which public attitudes demand "environmentally sound" pest control processes/programs.
6	The degree to which public attitudes support the cancellation of environmentally "unsafe" pesticides on a scale that may disrupt and/or inhibit agricultural production.
7	The degree of public support for environmental quality at the cost of economic ends.
8	The degree of public support for environmental quality objectives over energy assurance objectives.
9	The degree of public support for governmental (federal/state/local) environmental regulation.
10	The degree of public willingness to tolerate substantial government intervention and regulation of the environment.
11	The degree to which international regulation of the environment is accepted.
12	The degree to which people are willing to accept "soft proof" as evidence of the need for regulation.
13	The degree to which public attitudes permit a flexible environmental policy stance (e.g., changing regulations substantially and/or quickly).
14	The degree to which public attitudes support centralization of EPA regulatory decisions.
15	The degree to which prevailing conditions support an increased EPA budget.
16	Given a range of societal problems, the degree to which the public perceives environmental problems as being of relative significance.

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*This illustrative list of policy issues was developed on consultation with OPP. This list is not intended to be exhaustive of important policy issues.

for example, that in Scenario 3 in 1990 the level of support for environmental protection would be considerably below that which exists today. This conclusion would be represented by two down arrows.

Policy Issue/Scenario Matrix

In performing this analysis, we were most concerned with a policy overview; i.e., we searched for patterns of threats and opportunities that emerge by looking across many scenarios and many issues. The matrix form seemed most useful for such analysis and is shown in Figure 1. For greatest clarity each policy issue was stated in a way that would yield an "up" arrow when conditions seemed to be supportive of EPA goals and a "down" arrow when the conditions were not favorable to the realization of EPA goals.

Although the completed matrix is simple, the process of filling it in was not easy. It would sometimes take half an hour of discussion among four people--each holding a complex set of assumptions and hypothesized interactions relative to a future societal condition--to reach agreement on the nature of the most plausible policy issue/scenario interaction. Indeed, the thought and consideration that went into the simple representation of the interaction may be one of the most valuable portions of the analysis.

In filling in the matrix, it soon became apparent that, in some scenarios where there were two dominant societal groups with competing attitudes and values, we could not represent the prevailing condition with a single arrow. To reflect this "split" within the population on a given issue, we used two sets of arrows with a slash in between to represent that split (e.g., ↑/↓).

		Scenarios									
Policy Issues	Time	1	2	3	4	5	6	7	8	9	10
1. Intolerance of involuntary health risks	1980	↔	↓	↓	↓	↓	↓	↔	↓	↔	↔
	1990	↔	↓	↓	↓ ↓	↓ ↓	↓	↑	↑/↓	↑	↑
	2000	↔	↓	* ↑	* ↑ ↑	* ↑	↓	↑	↓	↑ ↑	↑ ↑
2. Importance of future health risks	1980	↔	↓	↓	↓	↓	↔	↔	↔	↔	↔
	1990	↔	↓	↓ ↓	↓ ↓	↓ ↓	↓	↑	↑/↓	↑	↑
	2000	↔	↓/↑	* ↑	* ↑ ↑	↔	* ↑	↑	↓	↑ ↑	↑ ↑
3. Intolerance of environmental degradation	1980	↔	↓	↔	↓	↓	↓	↓	↑	↔	↓
	1990	↔	↓ ↓/↑	* ↓ ↓	↓	↓ ↓	↓	* ↑	↑/↓	↑	* ↑
	2000	↔	* ↑	* ↑	* ↑ ↑	* ↑	* ↑	↑ ↑	↓	↑ ↑	↑ ↑
4. Incentive for pest control innovation	1980	↑	↓	↑	↓	↑ ↑	↔	↑	↑	↔	↓
	1990	↑	↓ ↓	* ↓	↔	↑	↑	↑	* ↓	↑	* ↑ ↑
	2000	↑	* ↑/↓	* ↑	↑	↑	↑ ↑	↑	↓	↑	↑ ↑

* Indicates a reversal has occurred.

FIGURE 1   POLICY ISSUE/SCENARIO MATRIX

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Policy Issues	Time	Scenarios 1	2	3	4	5	6	7	8	9	10
5. Demand for environmentally sound pest control	1980	↔	↓	↔	↓	↓	↓	↔	↑	↔	↔
	1990	↔	↓	↓↓	↓	* ↑	↔	↑	↑/↓	↑	↑
	2000	↔	* ↑	* ↑	* ↑↑	↑	↑	↑	↓	↑↑	↑↑
6. Support disruptive pesticide cancellations	1980	↓	↓	↓	↓	↓↓	↓	↓	↑	↓	↓
	1990	↓	↓↓/↑	↓↓	↓	* ↑	↓	* ↑↑	↑/↓	* ↑	* ↑
	2000	↓	↑	* ↑	* ↑	↔	↔	↑	↓	↑↑	↑↑
7. Environmental quality over economic ends	1980	↓	↓	↓	↓	↓↓	↓	↓	↑	↓	↓
	1990	↓	↓↓	↓↓	↓/↑	* ↑	↓	* ↑	↑/↓	* ↑	* ↑
	2000	↓	* ↑	* ↑	↑	↔	↔	↑	↓	↑↑	↑↑
8. Environmental quality over energy sufficiency	1980	↓	↓	↓	↔	↓↓	↓	↓	↑	↔	
	1990	↓	↓↓	↓↓	↑	* ↑	↓↓	↑/↓	↑	↑	N.A.†
	2000	↓	* ↓/↑	* ↑	↑↑	↑	N.A.†	↑	* ↓	↑	

*Indicates a reversal has occurred. †N.A. means not applicable.

FIGURE 1 POLICY ISSUE/SCENARIO MATRIX (Continued)

Policy Issues	Time	Scenarios 1	2	3	4	5	6	7	8	9	10
9. Support governmental environmental regulation	1980	↓	↓	↓	↔	↔	↓	↓	↑	↓	↓
	1990	↓	↓ ↓	↓ ↓	↑	↑	↓	↑/↓	↑/↓	* ↑	* ↑
	2000	↓	* ↑	* ↑	↑	↑	↓	↓	↓	↑	↑
10. Tolerate governmental environmental regulation	1980	↑	↓	↓	↔	↔	↓	↑	↑	↓	↔
	1990	↑	↓	↓ ↓	↑	* ↑ ↑	↓	↑/↓	↑	* ↑	↑
	2000	↑	* ↑	* ↑	↓	↑ ↑	* ↑	↑	* ↓	↑	↑
11. Accept international regulation of environment	1980	↔	↓	↓	↔	↓	↓	↔	↑	↓	↔
	1990	↑	↓	↓ ↓	↑	* ↑	↓	↑	↑	* ↑	↑
	2000	↑	↔	* ↑	↑ ↑	↑	* ↑	↑ ↑	* ↓	↑ ↑	↑ ↑
12. Acceptance of "Soft" proof of environmental damage	1980	↓ ↓	↓	↓ ↓	↔	↓	↓	↔	↑	↓	↔
	1990	↓ ↓	↓	↓ ↓	↔	* ↑	↓	↑/↓	↑	* ↑	↑
	2000	↓ ↓	↓/↑	* ↑	↑	* ↓	↓ ↓	↓	N.A.†	* ↓	↑

* Indicates a reversal has occurred. †N.A. means not applicable

FIGURE 1 POLICY ISSUE/SCENARIO MATRIX (Continued)

		Scenarios									
Policy Issues	Time	1	2	3	4	5	6	7	8	9	10
13. Acceptance of flexible policy stance	1980	↑	↑	↑	↑	↓	↑	↑	↑	↑	↔
						*					
	1990	↑	N.A.	N.A.	↑	↑	↑	↑	↑	↑	↑
						*	*	*			
	2000	↑	↓	↓	↑	↓	↓	↓	↑	↔	↑↑
14. Support centralization of environmental decisions	1980	↑	↑	↔	↔	↑	↓	↑	↑	↔	↔
						*					
	1990	↑	↑/↓	↓↓	↑	↓	↓	↑/↓	↑/↓	↔	↑
					*	*					*
	2000	↑	↑/↓	↓	↓	↑↑	↓	↑	↓	↑	↓
15. Support increased EPA budget	1980	↓	↔	↓	↔	↓	↓	↔	↑	↔	↔
			*			*					
	1990	↓	↓↓	↓↓	↓	↑	↓	↓	↑	↑	↑
			*	*	*			*	*		
	2000	↓	↔	↑	↑	↑↑	↔	↑	↓↓	↑↑	↑↑
16. Ranking of environmental problems	1980	↔	↓	↓	↓	↓	↓	↓	↑	↓	↓
					*	*		*		*	*
	1990	↔	↓↓	↓↓	↑	↑	↓	↑	↔	↑	↑
			*	*					*		
	2000	↔	↑/↓	↑	↑↑	↑	↔	↑	↓↓	↑	↑↑

* Indicates a reversal has occured.

FIGURE 1 POLICY ISSUE/SCENARIO MATRIX (Concluded)

Analysis Methodology

Cross-Scenario Analysis

Once the matrix had been scored, we began to analyze the results that emerged. To perform this analysis in a systematic way, we assigned weights to respective arrows as follows:

Substantial increase	↑↑	+2
Moderate increase	↑	+1
No change from present	↔	0
Moderate decrease	↓	-1
Substantial decrease	↓↓	-2

The results of scoring the matrix in this fashion are shown in Table 2. This table indicates for each scenario, aggregated across all issues, the relative degree and direction of aggregate change by time period (1980, 1990, and 2000) for each of the arrow vectors. The specific numbers that emerge are themselves not significant. Other persons may consistently judge differently the degree of change when making arrow assignments of scenario/issue interaction. Yet we think that if such assignments are made consistently across all issues/scenarios, the resultant numerical matrix offers useful insights into the overall policy climate. Our assessment of the policy climate as revealed by this analysis is discussed in Section V.

Cross-Issue Analysis

Having completed an assessment of the policy climate by lumping all issues together and seeing what form the scenarios take, we now turn to another significant dimension: How does the policy climate change with respect to a specific policy issue across all scenarios? To perform

Table 2

CROSS SCENARIO ANALYSIS

		Scenarios											
Time Frame	Weighting Factor	1	2	3	4	5	6	7	8	9	10	Total Raw Count	Total Weighted Net Score
							Raw Count						
1980													
	↑↑ +2	0	0	0	0	1	0	0	0	0	0	1	+2
	↑ +1	4	2	2	1	1	1	4	14	1	0	30	+30
	↔ -0	6	1	3	7	2	2	6	1	8	9	45	0
	↓ -1	5	13	10	8	9	13	6	1	7	6	78	-78
	↓↓ -2	1	0	1	0	3	0	0	0	0	0	5	10
	↑/↓ 0	0	0	0	0	0	0	0	0	0	0	0	0
	Weighted Net Score	-3	-11	-10	-7	-12	-12	-2	+13	-6	-6		-56
1990													
	↑↑ +2	0	0	0	0	1	0	1	0	0	1	3	+6
	↑ +1	5	0	0	7	11	2	9	6	15	14	69	+69
	↔ 0	5	0	0	2	0	1	0	1	1	0	10	0
	↓ -1	5	6	2	4	1	12	1	1	0	0	32	32
	↓↓ -2	1	6	13	2	3	1	0	0	0	0	26	-52
	↑/↓ 0	0	3	0	1	0	0	5	8	0	0	16	0
	Weighted Net Score	-2	-18	-28	-1	+6	-12	+10	+5	+15	+16		-9
2000													
	↑↑ +2	0	0	0	7	3	1	2	0	8	10	31	+62
	↑ +1	5	7	14	7	8	5	11	1	6	3	67	+67
	↔ 0	5	2	0	0	3	4	0	0	1	0	15	0
	↓ -1	5	1	2	2	2	4	3	12	1	1	33	-33
	↓↓ -2	1	0	0	0	0	1	0	2	0	0	4	-8
	↑/↓ 0	0	6	0	0	0	0	0	0	0	0	6	0
	Weighted Net Score	-2	+6	+12	+19	+12	+1	+12	-15	+21	+22		+88
Total	↑↑ +2	0	0	0	7	5	1	3	0	8	11	35	+70
	↑ +1	14	9	16	15	20	8	24	21	22	17	166	+166
	↔ 0	16	3	3	9	5	7	6	2	10	9	70	0
	↓ -1	15	20	14	14	12	29	10	14	8	7	143	-143
	↓↓ -2	3	6	14	2	6	2	0	2	0	0	35	-70
	↑/↓ -	0	9	0	1	0	0	5	8	0	0	23	0
	Weighted Net Score	-7	-23	-26	+11	+6	-23	+20	+3	+30	+32		+23

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this analysis we again used the numerical weighting system described above to yield a numerical assignment of the favorability of the social climate across all scenarios. Table 3 shows the specific numerical assessment of issues across time frames. The policy implications that emerged from this analysis are discussed in Section V.

Policy Reversal Analysis

The final major component of the policy overview required assessment of policy reversals. A reversal is defined as a clear change in policy direction that emerges from one time period to the next in the context of a given scenario (e.g., going from a short-run situation where there is great tolerance for environmental degradation to one in the subsequent time period where there is great intolerance for such degradation). Reversals are indicated in the policy/issue matrix by an asterisk. They occur when there is an abrupt change in arrow direction. We evaluated the frequency of such reversals for: a specific issue across scenarios, and across all issues for a specific scenario. Table 4 shows this frequency distribution. The policy implications, again, are discussed in the section on policy conclusions.

The foregoing analysis was aggregative--we were looking for general patterns of threats and opportunities that emerged from an examination of all scenarios and issues. The value of such analysis is limited to the extent that it tends to mask the details, i.e., when counterbalancing and offsetting numerical weights nullify the significance of any one policy issue/scenario interaction. Therefore, this analysis is but a first and a tentative step in exploring the policy implications of these scenarios for EPA. The succeeding steps must be taken by OPP planners themselves. Our suggestions as to how those steps might be taken are discussed in Section VI.

Table 3

CROSS-ISSUE ANALYSIS

Symbol	Weighting Factor		Issue																							
			1			2			3			4			5			6			7			8		
			1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000
↑↑	+2	Scenario count	0	0	3	0	0	3	0	0	4	1	1	2	0	0	3	0	1	2	0	0	2	0	0	1
		Weighted value	0	0	6	0	0	6	0	0	8	2	2	4	0	0	6	0	2	4	0	0	4	0	0	2
↑	+1	Scenario count	0	3	3	0	3	3	1	3	4	4	5	6	1	4	5	1	3	4	1	4	4	1	4	4
		Weighted value	0	3	3	0	3	3	1	3	4	4	5	6	1	4	5	1	3	4	1	4	4	1	4	4
←→	0	Scenario count	4	1	1	6	1	2	3	1	1	2	1	0	5	2	1	0	0	2	0	0	2	2	0	0
		Weighted value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
↓	-1	Scenario count	6	3	3	4	2	1	6	2	1	3	2	1	4	2	1	8	3	2	8	2	2	5	1	2
		Weighted value	-6	-3	-3	-4	-2	-1	-6	-2	-1	-3	-2	-1	-4	-2	-1	-8	-3	-2	-8	-2	-2	-5	-1	-2
↓↓	-2	Scenario count	0	2	0	0	3	0	0	2	0	0	1	0	0	1	0	1	1	0	1	2	0	1	3	0
		Weighted value	0	-4	0	0	-6	0	0	-4	0	0	-2	0	0	-2	0	-2	-2	0	-2	-4	0	-2	-6	0
↑/↓	0	Scenario count	0	1	0	0	1	1	0	2	0	0	0	1	0	1	0	0	2	0	0	2	0	0	1	1
		Weighted value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Net favorability of all scenarios for each policy issue	-6	-4	+6	-4	-5	+8	-5	-3	+11	+3	+3	+9	-3	0	+10	-9	0	+6	-9	-2	+6	-6	-3	+4

Table 3 (Concluded)

Symbol	Weighting Factor		Issue																							
			9			10			11			12			13			14			15			16		
			1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000
↑↑	+2	Scenario count	0	0	0	0	1	1	0	0	4	0	0	0	0	0	1	0	0	1	0	0	3	0	0	2
		Weighted value	0	0	0	0	2	2	0	0	8	0	0	0	0	0	2	0	0	2	0	0	6	0	0	4
↑	+1	Scenario count	1	4	6	3	5	7	1	7	4	1	4	3	8	8	4	5	3	3	1	4	3	1	5	4
		Weighted value	1	4	6	3	5	7	1	7	4	1	4	3	8	8	4	5	3	3	1	4	3	1	5	4
↔	0	Scenario count	2	0	0	3	0	0	4	0	1	3	1	0	1	0	1	4	1	0	1	0	2	1	2	2
		Weighted value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
↓	-1	Scenario count	7	2	4	4	2	2	5	2	1	4	2	3	1	0	4	1	2	5	4	4	1	8	1	0
		Weighted value	-7	-2	-4	-4	-2	-2	-5	-2	-1	-4	-2	-3	-1	0	-4	-1	-2	-5	-4	-4	-1	-8	-1	-0
↓↓	-2	Scenario count	0	2	0	0	1	0	0	1	0	2	2	2	0	0	0	0	1	0	0	2	1	0	2	1
		Weighted value	0	-4	0	0	-2	0	0	-2	0	-4	-4	-4	0	0	0	0	-2	0	0	-4	-2	0	-4	-2
↑/↓	0	Scenario count	0	2	0	0	1	0	0	0	0	0	1	1	0	0	0	0	3	1	0	0	0	0	0	1
		Weighted value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Net favorability of all scenarios for each policy issue	-6	-2	-2	-1	+3	+7	-4	+3	+11	-7	-2	-4	+7	+8	+2	+4	-1	0	-3	-4	+6	-7	0	+6

Table 4

POLICY REVERSALS

Issue	Time Period	Scenario 1	2	3	4	5	6	7	8	9	10	Total No. of Reversals per Issue	
1	1980-1990											0	3
	1990-2000			X	X	X						3	
2	1980-1990											0	3
	1990-2000			X	X		X					3	
3	1980-1990			X				X			X	3	8
	1990-2000		X	X	X	X	X					5	
4	1980-1990			X					X		X	3	5
	1990-2000		X	X								2	
5	1980-1990					X						1	4
	1990-2000		X	X	X							3	
6	1980-1990					X		X		X	X	4	6
	1990-2000			X	X							2	
7	1980-1990					X		X		X	X	4	6
	1990-2000		X	X								2	
8	1980-1990					X						1	4
	1990-2000		X	X					X			3	
9	1980-1990									X	X	2	[illegible]
	1990-2000		X	X								[illegible]	
10	1980-1990					X				X		2	6
	1990-2000		X	X			X		X			4	
11	1980-1900					X				X		2	5
	1990-2000			X			X		X			3	
12	1980-1990					X				X		2	4
	1990-2000			X						X		2	
13	1980-1990					X						1	3
	1990-2000						X	X				2	
14	1980-1990					X						1	4
	1990-2000			X		X					X	3	
15	1980-1990		X			X						2	7
	1990-2000		X	X	X			X	X			5	
16	1980-1990				X	X		X		X	X	5	8
	1990-2000		X	X					X			3	
Total No. of Reversals per Scenario		0	10	16	8	14	5	6	6	8	7		

Utility of the Policy Methodology

This methodology for using alternative futures in the policy planning process offers some significant advantages. It allows examination of one or a number of issues over time and in a variety of contexts, and the presentation of the results of that examination in a comprehensive yet easy to grasp form. It has the further advantage of allowing planners to arrive at a group conclusion, or enabling individuals to work separately and present their individual conclusions in a common format to a single individual who can identify commonalities and differences and derive his own conclusions. Finally, it provides a convenient means for presenting the results of the analysis in a quantitative form from which policy implications can be extracted.

V POLICY CONCLUSIONS

One principal finding from our research seems inescapable: The degree and rate of potential social changes during the period of analysis (1975 to 2000) are enormous. We have explored many plausible paths into the future. In nine of those ten pathways we conjectured that substantial discontinuity of trends long taken for granted, coupled with wrenching social change, was a plausible outcome. Admittedly, these alternative future scenarios are to some degree arbitrary; no one of them can be exactly predictive of the future. Rather, they are designed to help bound the domain of uncertainty and within their perimeter lies the spectrum of plausible futures.

General Discussion

For the nine futures incorporating major discontinuities, the analysis indicates that in six of them the industrial-age values and the social and economic institutions that express those values are dominant. The issues that arise and the policies devised to meet them reflect this situation.

However, the remaining three scenarios examine the possibility of a major change in values and a genuine transformation of American society. Since the way in which policy issues and options are viewed can be quite different under conditions of significant value change, it may be useful to discuss briefly the nature of the change foreseen in these three futures. Through this discussion EPA may obtain some indications of how the policy-making process itself would be transformed under conditions in which the very perception of human life and its purposes have been radically altered.

Our analysis, then, suggests the plausibility--indeed the likelihood--of social change well beyond the proportions one might infer from using the scenarios to examine only specific environmental issues. Indeed, by focusing concern solely on specific policy issues, the significance of social changes revealed by the alternative future scenarios may be obscured, and the perceived dimensions of impact of those changes, both personal and institutional, may be unduly narrowed. Because the forces that drive social change are largely external to EPA (in that they are beyond EPA's control), in order for EPA's policy-making process to be responsive to their implications, planning must be not only issue-specific but also contextual--that is, it must examine the dynamics of change in society.

Two major types of uncertainty emerge when we attempt to understand social futures. The first aspect of uncertainty relates to the behavior of specific individual trends such as climatological changes, energy sufficiency, and the world food problem. The second aspect of uncertainty emerges when we consider the synergistic interaction of multiple trends. In considering the latter, it becomes conceivable that we may be bordering on or in the midst of a transformation of our society--perhaps as significant as the change from a pre-industrial to an industrial society. By "transformation" we mean such a change of societal paradigm or world view that the basic way of perceiving, valuing, thinking, and doing associated with the industrial-age paradigm undergoes fundamental alteration. It behooves the policymaker to consider both the possibility of transformational change and continuation of the industrial-age when he formulates alternative futures for planning purposes.

We do not claim to perceive clearly the nature and dimensions of transformational social change. However, the rough outline of such change seems discernible.*

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*Further discussion of the notion of societal paradigm change occurs in several SRI/Center for the Study of Social Policy reports, but see in particular "Changing Images of Man," Policy Report No. 4, SRI (May 1974).

The industrial age has been characterized by the progressive organization and division of labor into standardized tasks, the replacement of men by machines in the performance of those tasks, and the joining of science and technology to further that development. The successes of the industrial age have been numerous: a remarkable increase in the material standard of living, better nutrition, prolonged life span, nearly universal education, highly advanced transportation systems, communications media that serve a "global village," and so on. However, these successes have also spawned problems. Health care improvements have caused overpopulation problems, scientific breakthroughs have created weapons of mass destruction, affluence has contributed to environmental pollution, communications technologies are used to invade our privacy, and so on. Practically all the serious problems of the industrial age seem to be the result of success--which, in turn, suggests that these problems may not be satisfactorily resolved within the context of the industrial paradigm whose very success creates these problems. An illustration of the "failure of our success" may be found in the fact that, the industrial paradigm, premised on the search for abundance, seems to be creating instead a "new scarcity" of

- Energy
- Materials
- Natural fresh water
- Arable land
- Unpolluted living environments.

Thus, what was a viable societal paradigm in times of abundance may be unsuccessful in an era of new scarcity and chronic shortages. Furthermore, there is the suspicion that the paradigm that served so well to build the technological-industrial apparatus to its present stage may serve less well in guiding it toward wise and humane use.

Two leading social-psychologists* have observed that individuals seem to have a dynamic hierarchy of needs so that, when basic needs such as food, clothing, and shelter have been met, higher needs such as self-esteem and self-realization become increasingly important. The industrial-age paradigm has met, with important exceptions, the basic needs of a majority of the American people. As a growing population segment seeks realization of higher level needs, which are not so easily satisfied by economic growth as are basic needs, we face a growing mismatch between the industrial paradigm (with an economic emphasis) and a post-industrial paradigm (with a greater emphasis on noneconomic ends). Fortunately, there is less conflict between the post-industrial paradigm and the industrial paradigm than one might think: given the "new scarcity" we are compelled to live more frugally; given the higher psychological need levels characteristic of the post-industrial paradigm, many people may voluntarily adopt a more frugal and conserving life-style. Therefore, a plausible future is one in which the voluntary simplicity of the post-industrial paradigm and the technological skills of the industrial age combine to solve the problems of scarcity and distribution.

Two complementary ethics seem highly compatible with the kind of transformation necessary for the resolution of many contemporary problems. One of these is an ecological ethic that recognizes man as an integral part of the natural world and hence inseparable from it and from its governing processes and laws. This ethic fosters a sense of the total community of man and a joining in partnership with nature to guide ecological relationships.

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*A. H. Maslow, Toward A Psychology of Being, 2nd Edition (Van Nostrand, 1968); C. W. Graves, "Human Nature Prepares for a Momentous Leap," The Futurist (April, 1974).

The second ethic is a self-realization ethic that asserts that the greatest challenge in the future will be that of realizing our still largely untapped individual human potential in community with others. The appropriate function of social institutions becomes the creation of a cultural environment that will foster such an evolutionary process.

These two ethics, the one emphasizing the total community of man-in-nature and the oneness of the human race and the other placing the highest value on development of selfhood, are not contradictory but complementary--two sides of a single coin. Together they allow for both cooperation and for wholesome competition, for sociality and individuality. Indeed, each serves as a corrective for possible excesses or misapplications of the other.

A more detailed exploration of differences between a transformed industrial paradigm and the extension of the industrial paradigm is shown in Table 5. The views of Herman Kahn, noted futurist, are used to describe the extension of the industrial paradigm. Although his views are perhaps somewhat extreme in the faith he exhibits in the continuing success of the industrial paradigm, nonetheless, they usefully serve to emphasize the contrast between these two paradigms. Both paradigms, or world views, seem to represent divergent but plausible pathways into the future and, since we cannot be certain which will in fact emerge, we are forced to admit the plausibility of both. The uncertainty created by two such differing futures makes unique demands on the planning process; in particular, it creates a need for:

- Trend monitoring--Trends and trend patterns need be monitored to establish the likelihood of emergence of one or the other paradigm and corresponding futures.
- Contingency planning--Given present ambiguity, it is essential to plan for both paradigmatic possibilities.

Table 5

TWO VIEWS ON FUTURE TECHNOLOGICAL AND ECONOMIC GROWTH

Transformed Industrial Paradigm[*]	Extended Industrial Paradigm[†]
Basic Model	
"New scarcity"--Technological-industrial progress has bumped into new planetary constraints. The "new scarcity" of energy and materials, natural fresh water, food-productive land, habitable space, waste-absorptive capacity of the environment, and resilience of the planet's life-support systems dictates that from now on these must be used frugally.	"Growing pie--No one knows accurately what the earth holds or can produce--or what new uses may be made of new or old materials. But 'growing pie,' 'expanding bowl,' 'exercised muscle' (or skill) are all good metaphors--i.e., within limits, the more one produces, the more one can produce. Furthermore, increases in productivity, wealth, and affluence anywhere often create conditions that allow or encourage similar increases almost everywhere."
Technology and Capital	
Frugal technology--These new conditions in no way suggest less need for technology, but rather need of a different kind of technology--more frugal of energy and materials, more cooperative with natural ecosystems, more adapted to differing cultural emphases, more humane. Capital will be needed for changeover to less polluting and resource-extravagant technologies, new energy sources, etc. In general, investors will have to be satisfied with a lower return on capital.	"Absolutely Necessary: New technology and capital investment are necessary not only to increase production to desirable levels, but to help protect and improve the environment, to keep resource costs down, and to provide an economic surplus for problems and crises. In any case, if we are reasonably prudent and flexible we will not have to contend with any really serious shortages in the medium run and the long run looks even better. (But we must be on alert for far-fetched and unlikely but potentially catastrophic events due to misunderstood innovations or inappropriate growth.)"
Management and Decision Making	
Changing social contract of business--A rough transition period is anticipated while new management structures are being designed. These will require strong private, public, and voluntary/nonprofit sectors, all with broad public responsibilities and stressing long-range outlook. Cultural change, plus modification of natural pricing to anticipate future costs and internalize external costs, will eventually make strong regulation unnecessary; but authoritarian government is likely to be invoked to maintain stability during the transition period.	"Probable Success--The systematic internalization of relevant external costs and the normal use of the price and other market mechanisms can deal with most issues. Some low but practical degree of public regulation and international cooperation can deal with most or all of the rest. With some possible exceptions, the level of management required is not remarkably high, particularly if the system normally learns from experience--even if slowly and painfully. (But good management can increase the speed and accuracy of reaction and reduce the pain.)"
Resources	
Severe pinch during transition period--Sharp shortages in various resources during the period of transformation. Adequate resources after system has adapted to demands of the "new scarcity."	"Adequacy--Leaving aside for the moment some very specialized and/or far-fetched issues, it would be possible to support, more or less satisfactorily (at least by likely middle-class standards) world populations of 20 or 30 billion at levels of 20 or 30 thousand (1974) dollars per capita for centuries; indeed, we could do this largely using only current and near current technology. Given likely technological progress we should do much better. Further, it is exactly technological progress and large economic surpluses make it likely that we can deal with these specialized and/or far-fetched issues if they arise."

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[*] Views developed in SRI's Center for the Study of Social Policy.

[†] Quoted from Herman Kahn's Post-Industrial Perspective, an informal paper.

Table 5 (Continued)

Transformed Industrial Paradigm[*]	Extended Industrial Paradigm[†]
Current Growth	
Slowdown and redefinition--Dropping off of economic growth brought about by external factors, depression; then redefinition of growth in less strictly economic and material terms. More forced redistribution of the petrodollar sort.	"Eventually a transition to stability--While such long-run projections are inherently uncertain, one can make a plausible case for world population stabilizing in the 21st century at about 15 billion, GWP/cap at about $20,000 and GWP at about $300 trillion. Give or take factors of, say, two, three and four respectively. (In other words, population should be between 7 and 30 billion, GWP/cap between $5,000 and $60,000 and GWP between $50 and $1,000 trillion.)"
Innovation and Discovery	
Shift of emphasis--More emphasis on social innovation and frugal technology, with probably a marked retardation of innovation during transition period.	"Huge improvements--New resources and technology and economic growth often produce new problems and crises but they can still be used to solve problems, improve efficiency, and upgrade the quality of life to a permanently high plateau. Even more important, they increase the toughness and flexibility of the economy and society--thus giving us insurance against bad luck or incompetency."
Income Gaps and Poverty	
Severe lasting problems--Economic decline in rich nations, followed by stabilization at a satisfactory level. World poverty will be a continuing problem for a long time. Famines and plagues out of control, high conflict level during and for some time after transition period. High and growing pressure for more equitable distribution of planetary resources.	"Poverty decreases--The next century will likely see worldwide abolition of most absolute poverty. However, some arithmetical gaps will probably increase until the middle or end of the 21st century. Both the rich and the poor will get richer, but some will continue to be much richer than others. But it is exactly these growing gaps and improved technology that make it easy to accelerate economic development for the poor."
Industrial Development	
Modified but continuing--Industrial development seriously retarded by depression and system breakdown during transition period, then resumed with modification. In third world, more adapted to their particular problems. In advanced countries, manifesting the changed social contract of business.	"Must continue--Industrialization of the third world will (and should) continue. It is foolish to imagine that the rich nations will voluntarily share to the extent of deprivation for the rich. And it probably is nonsense to believe that the poor will be strong enough in the foreseeable future to seize much of the wealth of the rich by force. Nor can they benefit greatly from resources left in the ground."
Quality of Life	
"Voluntary simplicity"--Unsatisfactoriness during transition period, but with growing numbers opting for "voluntary simplicity" (lowered material consumption; increased emphasis on community, inner exploration, relationship to nature, meaningful work). Eventual reconciliation of growth, in human terms, with high quality of life, appropriate technology, and humane social institutions.	"Eventually a high quality of life for all--If one does not adequately internalize appropriate external costs, growth can cause much unnecessary destruction of important values. But the key words are 'adequate' and 'appropriate' and by whose criteria. Much of what some elites or esoteric groups consider destructive, many others consider constructive. Once there is adequate internalizing of appropriate external costs (by the criteria of most members of society) the complaints may still be very shrill and visible but largely inappropriate or very specialized."
Long-Range Outlook	
Reasonably favorable--Traumatic transition probably unavoidable, possibility this may be followed by a "really post-industrial society"--but one cannot be too sanguine about the danger of failure to make the transformation, decline, and collapse.	"Things are going reasonably well--The 21st century is likely to see a post-industrial economy in which the more desperate and seemingly eternal problems of human poverty will have largely been solved or greatly alleviated. Most misery will derive from the anxieties and ambiguities of wealth and luxury, not from physical suffering due to scarcities. While doubtless many tragic mistakes and much suffering and damage will mark this historical transition to a materially abundant life for almost all, the ultimate prospect is breathtakingly superior to traditional poverty and scarcity. The post-industrial society and culture which will eventually accompany the post-industrial economy should be close to a humanistic utopia by most historic standards."

- Flexible policy--Given the divergent character of these two paradigms, in the short run it would seem advisable to search for an environmental policy that bridges them and, as far as possible, is appropriate to both.
- Expanded policy domain--Beyond specific issues of environmental concern, further concern for possible changes in the societal paradigm needs to be integrated into the policy deliberation process.

Keeping in mind the discussion in the preceding paragraphs, we now explore more specific issues relating to environmental policy.

Issue Analysis

As part of the policy overview process described in Section IV, we examined individual policy issues (such as public support for environmental protection programs) in the context of different futures. Our objective was to identify problems, threats, and opportunities common to a number of scenarios that represent a situation that will likely require a similar policy response, even though the futures contexts motivating that response may be quite different. The significant policy implications common to most (but not all) issue/scenario interactions are as follows:

- Tolerance for immediate health risks--In the short run it seems likely that people will be relatively tolerant of involuntarily assumed health risks; in the intermediate (1985+) and longer run (1995+) this trend generally is reversed. Thus, there does not seem to be a substantial amount of short-run support for environmental policy designed to minimize involuntarily assumed health risks.
- Tolerance for future health risks--In the short run, it seems likely that there will be little change in the public's casual attitude toward future risks to health; in the long run (1995+) the public's attitude will reflect a substantially increasing concern over future risks to health. Therefore, in making cost/benefit calculations of the impact of long-term risks, these potentially different degrees of willingness to assume risks must be considered.

- Tolerance for environmental degradation--In the short run there seems to be considerable tolerance for environmental degradation; in the long run this situation tends to change markedly. Therefore, it does not seem likely that EPA will be able to conduct an "activist" environmental policy in the short run, although circumstances seem more favorable in the longer term.

- Support of pesticide ban--Public attitudes seem overwhelmingly negative toward pesticide cancellations that would disrupt or inhibit agricultural production. In the long run public attitudes toward such cancellations are more supportive but still mixed when viewed across all scenarios. Therefore, the amount and character of proof of sufficient hazard to warrant major cancellations will likely escalate substantially, particularly by 1985.

- Economic versus environmental quality ends--In the short run, the public will likely rank economic ends higher than environmental quality ends; in the longer run this pattern of values tends to reverse and a concern for environmental quality becomes as important as a concern for economic well-being. Therefore, it is likely that the economic impacts of EPA/OPP action will have to be carefully considered, especially in the short run, if such policies are to gain public support.

- Energy sufficiency versus environmental quality--In the short run public attitudes seem to rank energy sufficiency (with an implicit dimension of employment sufficiency) higher than environmental quality. In the longer run, however, this pattern of values tends to reverse and environmental quality concerns become dominant. Nonetheless, this is anticipated to be a major future issue. Therefore, the energy implications of environmental policy need to be considered carefully.

- Support versus tolerance for environmental regulation--In the short run there appears to be little overt support for "activist" environmental regulation by the government, but there is considerable tolerance for such regulation. This tolerance increases from 1985 on. Therefore, although there may be no massive or outspoken demand for EPA/OPP policy, there is still considerable latitude in terms of public tolerance for implementing such policy if it seems in the public interest.

- Support for international environmental regulation--In the short run there seems to be little public support for international regulation of the environment, but by 2000 a much more favorable attitude toward such regulation emerges. Therefore, attempts to recognize, through public policy, ecological interdependencies that cross national boundaries are likely to confront substantial resistance in the short run.
- Value of hard proof--Overall, throughout the entire period of analysis, the value of hard proof (empirical, analytical, rigorous) to support regulatory decisions remains relatively high. This is as close to a constant across all scenarios and time frames that we have found. Therefore, EPA may have to increase its research budget to obtain such hard proof to bring to regulatory decisions.
- Value of flexibility--A flexible policy stance would seem required of EPA in the 1975-1990 period. This stance is not always of benefit to EPA since flexibility can cut both ways. In general, this appears to be a very fluid policy-making period, with flexibility a near necessity at least through 1990.

These are cursory generalizations about the policy climate across a variety of futures. More expanded policy interrogations of the alternative futures scenarios is also possible. We present the following illustrative examples of such extended analysis in order to clarify the exploration of interaction between policy issue and specific scenarios.

Example 1: Immediate Health Risks

In the short run--roughly into the mid 1980s--tolerance for involuntarily assumed health risks remains at about present levels or, in response to what appear to be economic exigencies, even increases somewhat. In the later phases of most scenarios there is less tolerance than at present for acceptance of such risks. The implications are, excluding a pesticide-related health catastrophe on the lines of a thalidomide case or massive incidence of lethal or debilitating disease, that those charged with reducing health risks related to pesticide use will not be pushed by the general public to take rapid or drastic action. Indeed, in some futures there will be more active public resistance _to_ than support _for_ such action. However, in almost all futures, even in the absence of dramatic occurrences, the decade of the 1990s shows a reversal, sometimes a very strong reversal, in attitude.

Assuming that the logical processes employed in reaching this conclusion are valid for purposes of policy planning, and assuming also that in all the scenarios EPA is constrained to some extent in its activities by effective public opinion, the indication here is for a policy of research, demonstration, and public education in the period to 1985. By 2000 a stronger policy of enforcement not only would be acceptable but demanded.

Example 2: Future Health Risks

Tolerance for future health risks shows a similar pattern except that the reversal is somewhat less strong by 2000. Hence the policy implications are somewhat similar.

Since both this issue and the preceeding one are health related, it seems likely that pesticide policy planning for meeting them will have to be considered in the context of public health policy planning generally. Such a conclusion presumes a degree of interaction with other public health agencies concerning the pesticide-health relationship.

Because the health risks presented by pesticides are associated on the one hand with the manufacture, distribution, sale, and application of pesticides and on the other hand with the consumption of products to which pesticides are applied, both worker and consumer protection agencies would probably be involved. Finally, since the term "involuntarily assumed health risks" could be construed narrowly to apply only to those who choose neither to work with pesticides nor to purchase pesticide-treated products but who are nevertheless exposed to pesticides or pesticide residues as DDT traces in the air they breathe, the water they drink, or the food they consume (e.g., ocean fish or even mothers' milk), there may be a clientele whom only EPA or general health agencies can serve.

Given the conjecture that in most scenarios there will be little public pressure for eliminating or reducing noncatastrophic pesticide-related health hazards through 1985 or 1990, EPA might select from among the following policy options:

(1) EPA could adopt a more or less passive stance. Through its interaction with health agencies, it could choose merely to compile information for release to interested parties and it could make its data and other expertise available for use in civil damage suits that might arise from the incurrence of disease related to pesticides.

(2) It could adopt active programs of research and education about pesticide-health relationships while still relying on the enforcement arms of health agencies and the effectiveness of private tort actions and avoiding a direct police role. As part of such a policy EPA could mount campaigns to alert the public to health-pesticide relationships through a variety of means, up to and including the requirement of a warning label on pesticide-treated products along the lines of the Surgeon General's warning on cigarette packages.

(3) EPA could seek actively to expand its power to regulate pesticides and their use where such use can be related to disease even in the absence of significant public concern. Public tolerance for long- or short-term health risks should not be construed as excusing EPA from its duty to protect the public from the adverse effects of pesticide use as the law requires it to do.

Obviously, this list of policy choices related to any one issue is not exhaustive or all-inclusive. The selection of one policy or of alternative policies through the examination of issues in a variety of future environments is largely a subjective process entailing, at the point of selection, a determination by the policy planner of what seems to fit best.

Scenario Analysis

Section IV explained the methodology of cross-scenario analysis, a process whereby we explored the policy implications of each of the ten futures while aggregating or lumping-together the policy issues. We assume that the ten scenarios substantially bracket the range of plausible futures in which pesticide policy planning can, in any significant sense, play a role in the preservation of a natural environment compatible with organized and culturally acceptable forms of human existence. It is useful, then, to see what range of plausible futures has been embraced by this process.

We did not design the future scenarios to be "good" or "bad" with respect to the realization of EPA goals; nonetheless, they are quite balanced in that four seem compatible with realization of those goals (which roughly fall under the rubric of environmental protection). Four scenarios are detrimental from the point of view of those seeking to reach EPA goals, and two scenarios are relatively unchanged from the present in this regard.

The spectrum of futures is quite great; it ranges all the way from a status quo extension of our achievement society, to the transformation of society and the simultaneous emergence of a so-called "frugal" sector, to the near breakdown of social systems yielding an increasingly substantial group of so-called "survivors." Thus, there is sufficient diversity in these futures to embrace most contemporary anticipations of the future by serious authors whose theories are highly regarded.

What can we then say about the plausible future as we scan across these scenarios? A major conclusion from our analysis, with respect to the overall favorability of the future social climate for realizing EPA goals of environmental protection, is that:

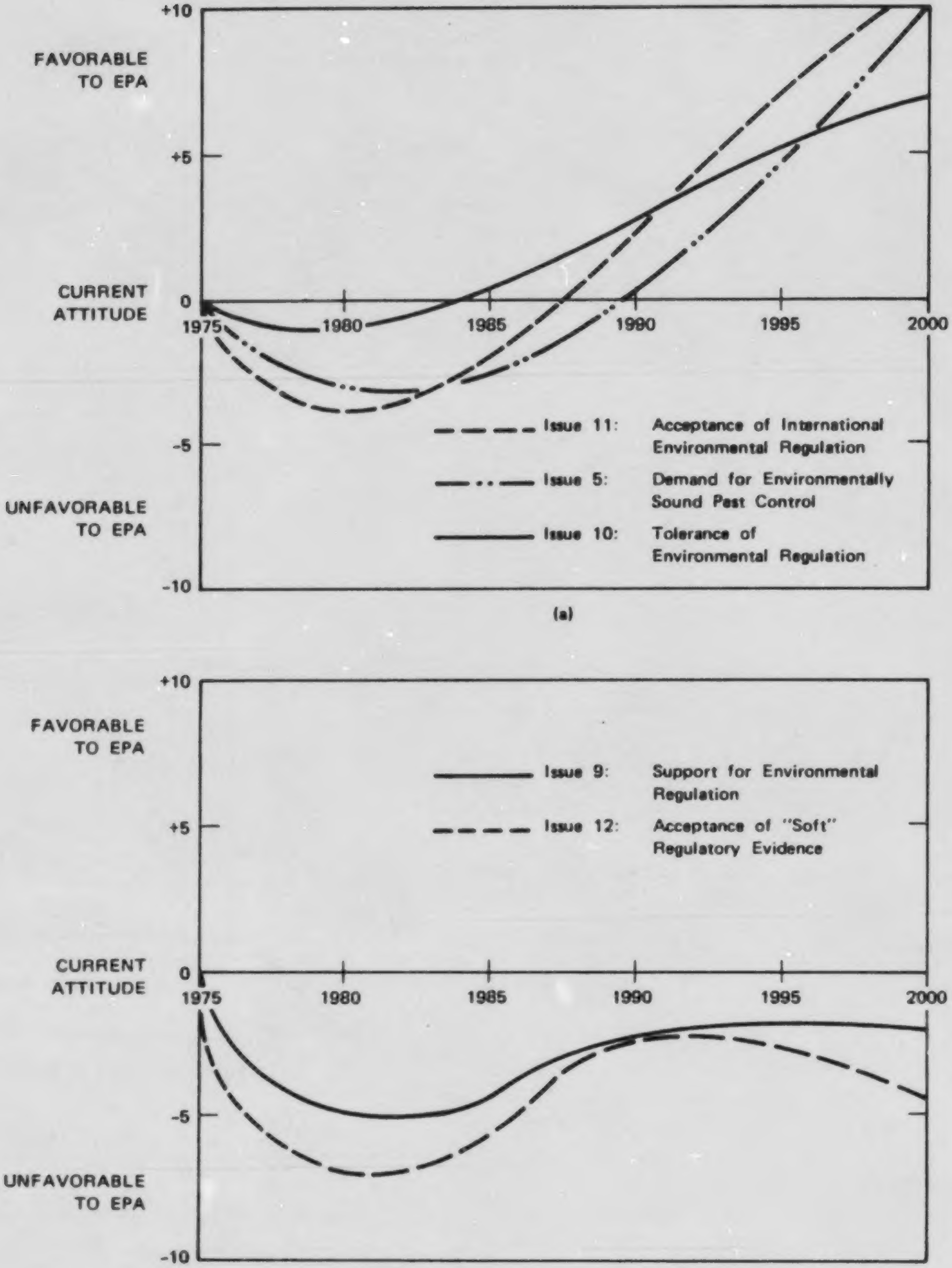
- The realization of EPA goals will likely be significantly more difficult in the short run (1975-1985).
- There will be a return to a more environmentally conscious society but society will be held back from environmental activism by economic factors in the intermediate run (1985-1995).
- Strongly environmentalist attitudes supportive of EPA will emerge in the long run (2000+).

This general assessment of the dynamics of public (and therefore political) support for environmental protection is reflected in Figure 2.

Metaphorically, it is as though EPA/OPP can travel many pathways into the future; yet, along many if not most of the paths the ride is quite rough in the short run, smoother in the intermediate run, and excellent farther down the road. A caveat seems important: Whether or not each of these futures contributes to the realization of EPA goals should not be the sole criterion for judging its desirability. Living in any one of these futures could present a far different picture of its desirability than might be judged by simply assessing its support for environmental quality.

A second significant conclusion emerges from this aggregate assessment of the spectrum of future:

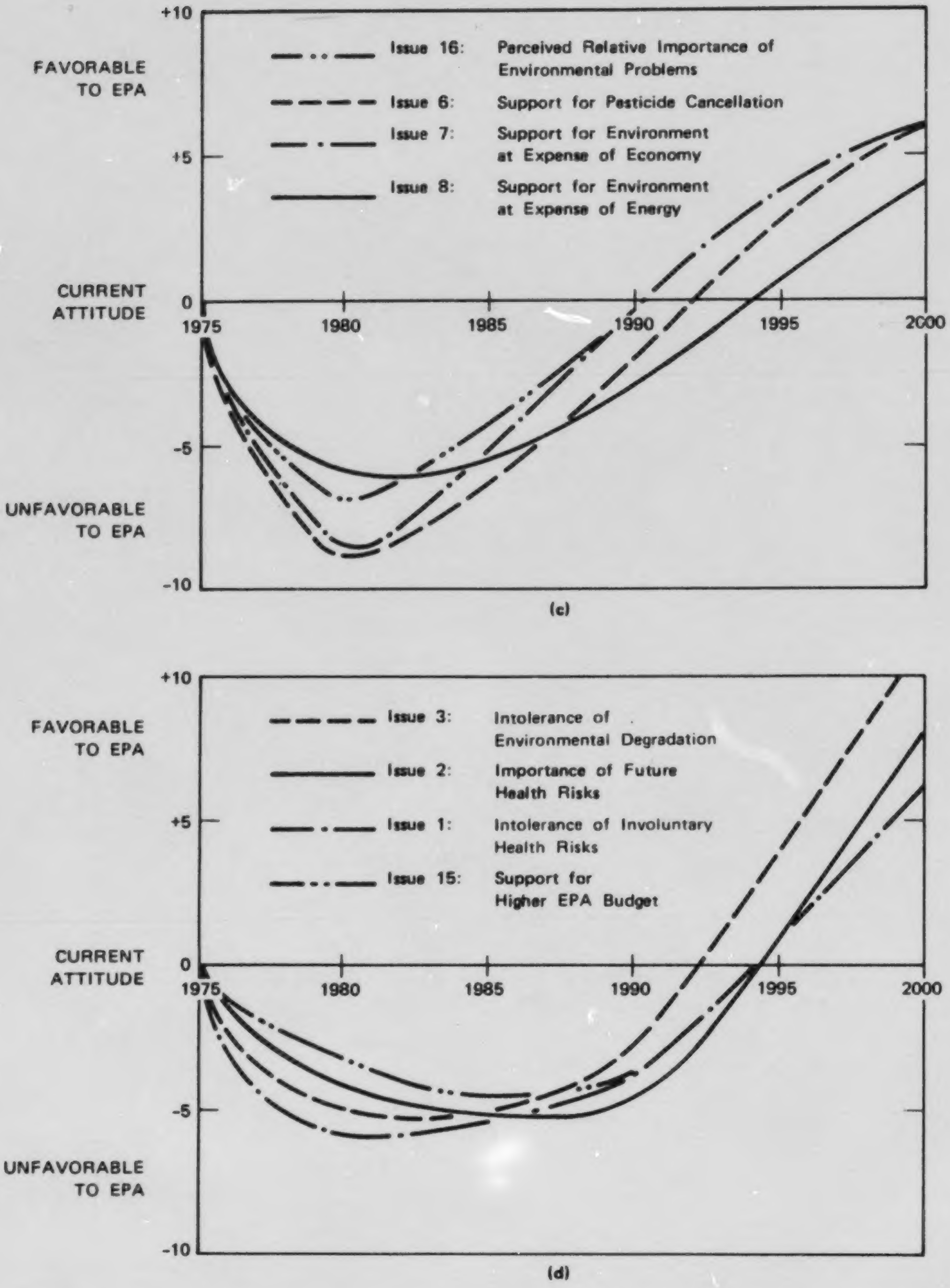
- Given the strength of the antienvironmentalist position until the late 1980s, it would seem that a strong regulatory posture and policy may not only be ineffectual--given a lack of public support--but it might also result in the reduction of EPA capability to act effectively in succeeding periods. To draw on a military analogy, the planner might consider the maxim that the only reason for going on the defense is to gain time for amassing sufficient resources (in this case, public opinion) to resume the offense. Therefore, one possible response to the social climate anticipated herein is to concentrate on maintaining credibility, husbanding resources, and preparing for the resumption of an even more active program when circumstances are more favorable (after late 1980s). However, the avoidance of confrontations that



(a)

(b)

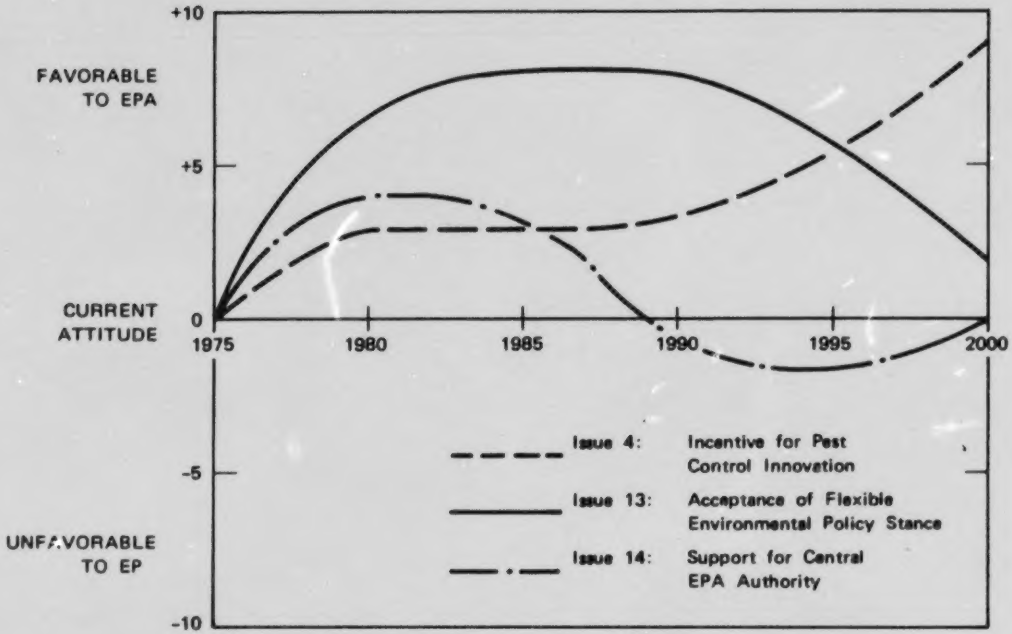
FIGURE 2 NET FAVORABILITY OF SOCIETAL ENVIRONMENT FOR MEETING EPA GOALS OF ENVIRONMENTAL PROTECTION, ACROSS ALL SCENARIOS (DERIVED FROM WEIGHTED NUMERICAL SCORES TABLE 2, P. 170 AND GROUPED ACCORDING TO SIMILAR BEHAVIOR)



(c)

(d)

FIGURE 2 NET FAVORABILITY OF SOCIETAL ENVIRONMENT FOR MEETING EPA GOALS OF ENVIRONMENTAL PROTECTION, ACROSS ALL SCENARIOS (Continued)



(a)

FIGURE 2 NET FAVORABILITY OF SOCIETAL ENVIRONMENT FOR MEETING EPA GOALS OF ENVIRONMENTAL PROTECTION, ACROSS ALL SCENARIOS (Concluded)

> cannot be won in the atmosphere of the late 1970s and 1980s does not mean adoption of a spineless policy of concurrence on environmentally harmful activities. Rather, what is implied is the defense of previous gains, continued research, expansion of environmental education, and preservation of the integrity of EPA to the end of ensuring environmentally sound practices, in pesticide use and elsewhere, in anticipation of the period when an activist policy can be resumed. Clearly, such a policy posture is but one among many that are possible. Nonetheless, this is illustrative of the kind of strategic policy responses that may be extracted from a careful assessment of alternative futures.

The above sampling of policy implications from the alternative futures scenarios merely indicates a number of approaches to policy planning that might be employed. The value of using several structured and defined methods for drawing implications lies not so much in any assurance that the ultimate policy decision automatically will be revealed to the planner, but that he will be forced to examine alternative futures from alternative perspectives--thus gaining a fuller understanding of the dimensions of the problem and the factors influencing his choice of policies.

Policy Reversal Analysis

A policy reversal is defined as a clear and substantial change in policy direction that emerges from one time period to the next in the context of a given scenario. Scenarios in which there are significant discontinuities or reversals pose a special problem for the policy planner. Effective planning under such circumstances requires the establishment of policies that will lead to the achievement of the planner's goals despite the reversal. Or, in cases where the reversal reflects a change in policy direction that necessitates the establishment of different goals, it requires anticipation of what goals are appropriate and what means are best suited for their achievement.

Policy reversals were mapped and tabulated in Section IV and were made for a specific issue across all scenarios and for a specific scenario across all issues. Alternative future Scenario 1 provides a baseline against which to assess the reversal frequency distribution because this future is essentially that of the status quo extended, without any major trend discontinuities. In all other scenarios there were a substantial number of reversals. Further, for all issues, when viewed in the context of all scenarios, there were also a substantial number of reversals.

Scenario 3 provides the clearest example across most issues of a sharp reversal. The period from the present through the late 1980s is uniformly unfavorable to EPA objectives; environmental concern is low, and there is persistent effort to pursue industrial-age goals to the detriment of environmental goals. However, the near collapse of the urban-industrial economy produces an abrupt reversal in the 1990s. In subsequent periods and across virtually all issues, public attitudes and objective conditions provide renewed support for EPA goals.

The prevalence of policy reversals reveals another dimension of the dynamics of change between 1975 and 2000 and also provides another compelling reason for anticipatory policy planning.

Other Issues

A final issue, not dealt with explicitly in the formal analysis, lies in the background as a source of difficulty. When approaching the issue of "environmental protection," we were confronted again and again with the uncertainty as to the application of such protection, particularly in the context of alternative futures. In other words, environmental protection for whom?

Operational pesticide policy seems to regulate the use of pesticides in a manner that prevents harm to the "environment" (where harm to the "environment" is essentially harm to human beings). Present values and current legal opinions tend to interpret harm to human beings as applying primarily to living human beings, but also include unborn human beings when there is overwhelming evidence that the application of pesticides is likely to cause mutagenic and/or teratogenic effects.

In this present-oriented consideration of harm to human beings (rather than all life forms or all animal forms), the priority ranking is one that gives great weight to basically economic factors. In agriculture, where the necessity to produce sufficient food to support human life is obvious, the argument is made that even at the risk of harm to some human lives, especially those involved in the production of that food, some otherwise harmful pesticides must be used lest more human lives be endangered by lack of food. This argument has some force. In certain of the ten scenarios, premised on chronic energy shortages and a worsening climate, both values and objective conditions support maximized production through the use of all available means almost regardless of possible long-term effects. A high degree of risk will be accepted in the interest of either short-term survival or short-term profit. Environmental policy will, in these futures, strive to lessen the effects of the inevitable damage.

The foregoing serves to illustrate the importance of defining the components (whom and what) to which the term "environmental protection" applies and the importance of the criteria by which such protection is applied (e.g., present versus future, economic versus aesthetic values). The appropriateness of the definition of the components for which these laws are being administered is in itself a legitimate subject of policy concern, particularly given the apparent fluidity of the future policy environment and the likelihood that EPA/OPP may well have to develop changing definitions of whom and what to protect.

Summary

The plausibility of great social change--perceived as regressive by some, transformational by others, and bewildering by many--coupled with uncertainty about the exact timing, nature, and dimensions of that change calls for an innovative policy-planning process. More specifically, it is our judgement that the planning process appropriate to the range of plausible social environments revealed by these scenarios would have to do the following:[*]

- Live with and acknowledge uncertainty--By openly acknowledging the uncertainty revealed in this analysis, what we do not know and what we need to learn to act knowledgeably becomes clearer. Living through periods of uncertainty is a difficult planning requisite in contemporary bureaucracies, and civil servants should not be reluctant to admit that they just do not know the answer.
- Embrace error--Instead of avoiding acknowledgment of error, it is increasingly necessary to expect error, to seek out its manifestations, and to use information derived from error as a basis for learning. Too often error is equated with poor judgment; however, a failure to embrace error makes future judgments all the more difficult since it eliminates both the feedback and learning element of policy formulation.
- Engage in goal setting--Goal setting is a useful but difficult process; it clarifies dimensions of conflict and may well increase the stress of decisionmaking. Goal setting also clarifies the difference between policy that is reactive to a probable future and policy that is anticipatory of a desirable future. Goal setting provides a way of stating what

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[*] Many of these planning processes are discussed at length in Donald Michael's enormously useful book: On Learning to Plan--And Planning to Learn San Francisco: Jossey-Bass, 1973).

is to be learned, and it is a necessary process for discovering whether we are learning. Goals are not necessarily set to commit us to getting from A to B but to provide a means of discovering where we are and where we think we want to go, given our understanding of A and B. As Michael notes, "We cannot evaluate whether we are approaching a desired future condition without having specified how that condition is to be recognized."

- Foster first-hand experience--Reading or listening to someone speculate about the future is not the same as speculating for oneself. To understand fully a range of future possibilities, the policymaker himself must so address the future that his intellectual understandings are stretched, images of the future based on projections of past experience are tested, and "visceral" appreciations of the future are developed.
- Span boundaries--Most of the driving forces that will likely be the source of discontinuous social change (e.g., energy, climate, food, values) are beyond the purview of most of EPA's immediate policy-planning concerns. This is one example of the need to transcend institutional boundaries in assessing realistically the primary sources of change. Thus, in the future there will likely be an even greater need for spanning the boundaries between institutions like the EPA and the society within which they operate and among the various units within institutions (e.g., OPP and equivalent line groups).

This report provides only a starting point; the structured methodology and preliminary findings constitute a working base from which EPA/OPP can continue its policy planning along both process and substantive dimensions. Some suggestions as to how to make further use of this methodology and process are discussed in the following section.

VI USING THE REPORT

The Environmental Protection Agency has invested considerable resources through sponsorship of this and other studies in futures research. The system for futures-oriented policy planning developed in this project must now find continued use by EPA. Few will argue that the results of this research are uninteresting; creatively exploring the future almost always is interesting. However, the pressures of short-run and immediate problems often act to defeat any continuing effort at focusing on longer range concerns. The consequences of failing to cope with the immediate will be experienced, often personally, in the short-run, but, the failure to exercise the same concern for the long run will create socially negative consequences in the still more distant future.

It was with the hope of focusing attention on future concerns that EPA initiated this project. Even with the best of intentions, unless some structured mechanism designed to ensure continuing consideration of the future is established and used, present concerns will continue to push aside future concerns. We believe that continuing consideration should be internal to EPA and not an activity assigned exclusively to outside consultants; only by internalization can information on new trends and new influencing factors become integrated into the ongoing decision-making process of EPA. Thus, this final section of the report will present a suggested approach to creating a mechanism for continued watchfulness based on the research presented here.

This approach consists of three major interrelated components: trend monitoring, modifying and updating scenarios, and internal policy analysis.

Continued Trend Monitoring

In the ten scenarios presented in Section III, EPA now has a series of alternative futures. However, at best, only one of these can most nearly describe the future as we move into it. It is likely that none will precisely describe the future as it becomes the present. To know which alternative track we are actually moving down and in what ways events differ from the projected scenarios, the scenarios must continually be tested against reality. This reality testing is accomplished through monitoring, described below in three parts: what to monitor, how to manage the monitoring system, and how to use the monitoring system.

What to Monitor

We suggest that driving trends, general trends, futures literature, and issues/events be monitored on a regular basis.

Driving Trends

The ten alternative scenarios presented earlier were constructed through the consideration of four driving trends: energy, climate, food supply, and values. One reason the scenarios were developed in this fashion was to facilitate ongoing monitoring; that is, to make possible assessment of the validity of each scenario in objectively measurable terms. For example, one scenario is based on a high growth rate in the consumption of energy through the remainder of this decade. As the years pass it will be possible to monitor the actual growth rate. If that rate conforms to the rate projected in the scenario, then it is possible that we are moving down that track. (The three other driving trends must also be considered, as well as the possibility that we may move off that scenario at some future date.) If the actual energy consumption growth rate fails to conform to the projected rate for a given scenario, it is not likely that that scenario will actually come to pass.

Each driving trend can be considered as a necessary but not sufficient condition for assessing the scenario; the four trends must be considered together. As will be shown later, even this is not quite sufficient to assess the scenario.

Energy Consumption--With respect to energy, the driving factors to monitor are the growth rate and public energy policy. As both economic growth and the long-term energy supply situation are significantly affected by the rate of use, the change in the rate of energy use over time rather than the absolute consumption level at any given time is of greater interest. Table 6 presents data sources for this and other trends.

Climate--The interest in climate is focused both on its quality as it affects agriculture and on its stability. "Quality" is used here to mean such factors as temperature, rainfall, and length of growing season; "stability" is used to mean how constant from year to year the climate pattern is. If the pattern is highly variable, adjustment of agricultural practices and policies will be difficult. A general worsening in some areas, or even many areas, is easier to cope with than significant annual variations.

Climatic data are not as easy to track as energy consumption trends. Concern for the uncertainty of long-term climatic patterns is a relatively recent issue; hence the data sources are neither as extensive nor varied as energy data. However, with the inception of the Climatic Impact Assessment Program (CIAP) of the National Oceanic and Atmospheric Administration (NOAA), this situation should improve.

Food--In food trends, the two dimensions most important for monitoring purposes are relative price and availability. Other external

Table 6

SUGGESTED SOURCES FOR TREND MONITORING

Trend Topics Driving Trends	ENERGY	CLIMATE/Weather	FOOD	Food Consumption	Food Production	Food Trade	VALUES/Social/Cultural	GENERAL TRENDS	Agriculture	Crime/Social Disruption	Demographic	Economic	Education	Employment	Environment	Farm Labor	Fertilizer	Health	International Conflict	Political/Ideological	Resources	Technology
Periodicals/Journals																						
Advances in Environmental Science and Technology															X							X
Advance Job Listings														X								
Advanced Weather Forecasts		X																				
Agrichemical Age									X								X					
Agricultural and Biological Chemistry Newsletter									X													
Agricultural Chemistry and Commercial Fertilizer									X								X					
Agriculture and Chemistry Newsletter									X													
Agricultural Meteorology		X																				
Agricultural Research (USDA)									X													
American Journal of Public Health and The Nation's Health							X											X				
American Universities and Colleges													X									
Annual Review of Ecology and Systemics															X							
Bio-Dynamics															X						X	
Bulletin of the Atomic Scientist	X																		X	X		X
*The Center Magazine							X												X	X		
Christian Science Monitor							X												X	X		
*Co-Evolution Quarterly							X															
Comparative Politics																			X	X		
Consumer-Farmer Cooperator News			X						X													
Crime and Delinquency										X												
Crop Science									X													
Current							X												X	X		
Current Population Reports by Income											X											
Demography											X											
Down to Earth					X				X													
Early Childhood Education Directory													X									
*The Ecologist	X						X								X							
Economic Indicators (Council of Economic Advisors)												X		X								
Economic Outlook U.S.A.												X								X		
Employment and Earnings Statistics for the United States												X		X		X						
Engineering Research and Development in Agriculture									X													
Environmental Law Review															X						X	
Environmental Studies															X						X	
Environmental Technology and Economics												X			X			X				X
Environmental Times															X						X	
Experimental Agriculture			X						X													
Farm Bureau News																X						

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*Sources recommended for a selective, less exhaustive trend monitoring effort.

Table 6 (Continued)

Trend Topics	ENERGY	CLIMATE/Weather	FOOD	Food Consumption	Food Production	Food Trade	VALUES/Social/Cultural	GENERAL TRENDS	Agriculture	Crime/Social Disruption	Demographic	Economic	Education	Employment	Environment	Farm Labor	Fertilizer	Health	International Conflict	Political/Ideological	Resources	Technology
Periodicals/Journals (Continued)																						
Farm Economics					X											X						
Farm and Food Research			X						X													
Farm and Home									X													
Farm Income Situation (USDA)																X						
Farm Labor																X						
Farm: Progress in Mechanization																X						X
Farm Trends																X						
Feed Bulletin									X													
Fertilizer International																	X					
Fertilizer Progress									X								X					
Fertilizer Solutions									X								X					
Fields Within Fields							X															
Food Chemical News			X																			
Food Distribution Research Society Newsletter						X																
Food Engineering			X																			
Food Outlook (USDA)			X																X			
Food Production/Management					X																	
Food Technology					X																	X
Foreign Affairs																			X	X		
Foreign Policy																			X			
*Futures							X					X	X						X	X	X	X
*Futurist	X	X	X				X		X	X	X	X	X	X	X			X	X	X	X	X
Good Earth					X				X													
Handbook of Basic Economic Statistics												X										
Harvard Business Review												X										
Health Aspects of Pesticides Abstract Bulletin				X					X													
Health Care Today																		X				
Health Food Trader				X																		
Health Products Newsletter				X																		
Health Services Research																		X				
Health Trends (Great Britain)																		X				
International Affairs (Oxford)																			X	X		
International Organization																			X	X		
Issues in Criminology										X												
Journal of Agriculture and Food Chemistry					X				X													
Journal of Agricultural Science									X													X
Journal of Conflict Resolution																			X			
Journal of Educational Psychology													X									
Journal of Food Technology				X	X	X																X

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*Sources recommended for a selective, less exhaustive trend monitoring effort.

Table 6 (Continued)

Trend Topics	ENERGY	CLIMATE/Weather	FOOD	Food Consumption	Food Production	Food Trade	VALUES/Social/Cultural	GENERAL TRENDS	Agriculture	Crime/Social Disruption	Demographic	Economic	Education	Employment	Environment	Farm Labor	Fertilizer	Health	International Conflict	Political Ideological	Resources	Technology
Periodicals/Journals (Continued)																						
Journal of Milk and Food Technology				X	X	X																X
Journal of Health and Social Behavior							X			X								X				
Journal of Peace Research																			X	X		
Journal of Research in Crime and Delinquency										X												
Journal of the Science of Food and Agriculture			X						X													
Journal for Scientific Agriculutral Research									X													X
Kiplinger Agricultural Letter									X													
Labor Trends														X		X						
Main Currents in Modern Thought							X															
*Manas							X															
Manuals on Adult and Youth Education													X									
Monographs in Population Biology											X											
National Food Situation (USDA)			X																			
*National Review																			X	X		
*New Republic							X												X	X		
Newsweek	X	X					X			X	X	X	X	X	X				X	X	X	X
Orbis																			X			
Outlook on Agriculture									X													
Pesticides Monitoring Journal									X													
Pollution Monitor (Great Britain)															X							
Population Monograph Series											X											
Population and Reproduction Research Abstracts											X											
Problems in Education													X									
Produce News					X																	
Public Opinion							X															
Report on Food Markets						X																
Research Quarterly									X													
Research Studies in Education													X									
Researcher									X													
*Science	X	X													X						X	X
Science in Agriculture									X													X
Shape of Education													X									
Statistical Yearbook							X				X	X	X	X								
Studies in Compulsory Education													X									
Summary of Teacher Training Courses at College and Departments of Education													X									
Survey (London)																			X	X		
Systems Engineering of Education													X									
Teacher's Magazine																						
*Technology Review													X									X

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*Sources recommended for a selective, less exhaustive trend monitoring effort.

Table 6 (Continued)

Trend Topics	ENERGY	CLIMATE/Weather	FOOD	Food Consumption	Food Production	Food Trade	VALUES/Social/Cultural	GENERAL TRENDS	Agriculture	Crime/Social Disruption	Demographic	Economic	Education	Employment	Environment	Farm Labor	Fertilizer	Health	International Conflict	Political Ideological	Resources	Technology
Periodicals/Journals (Continued)																						
*Wall Street Journal	X				X	X	X				X	X	X	X	X				X	X	X	X
Washington Food Report						X																
World Affairs																			X	X		
World Agriculture									X													
World Directory of Environmental Research Centers															X							
World Environmental Directory															X							
World Yearbook in Education													X									
Weekly Digest						X																
Wildlife Behavior and Ecology															X							
Working Papers							X												X	X		
Irregular publications																						
Advances in Food Research			X																			X
Agricultural Chemical Manual					X				X													X
Agriculture Information Bulletin (USDA)									X													
Agricultural Statistics (USDA)									X													
American Meteorological Society Bulletin		X																				
American Meteorological Society Monographs		X																				
Food Science			X																			
Fertilizers: An Annual Review of World Production, Consumption, and Trade																	X					
Fertilizer Industry Round Table Proceedings																	X					
Fertilizer Industry Series (United Nations)																	X					
Fertilizer Science and Technology																	X					X
Fertilizer Trends																	X					
Insecticide and Fungicide Handbook for Crop Protection (Great Britain)					X				X													
International Agricultural Series									X													
Pesticide Review									X													
Recent Advances in Food Science				X																		
World Economic Survey (United Nations)												X							X		X	
World Food Programme Studies (United Nations)			X																X			
World Weather Watch Planning Reports		X																				
Abstracts and Indexing																						
Abstracts on Criminology and Penology										X												
Agronomy Abstracts									X													
Applied Science and Technology Abstracts	X																				X	X
Biological and Agricultural Index									X									X				
Crime and Delinquency Literature										X												

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*Sources recommended for a selective, less exhaustive trend monitoring effort.

Table 6 (Continued)

Trend Topics	ENERGY	CLIMATE/Weather	FOOD	Food Consumption	Food Production	Food Trade	VALUES/Social/Cultural	GENERAL TRENDS	Agriculture	Crime/Social Disruption	Demographic	Economic	Education	Employment	Environment	Farm Labor	Fertilizer	Health	International Conflict	Political/Ideological	Resources	Technology
Abstracts and Indexing (Continued)																						
Current Contents--Agriculture, Biology, and Environmental Sciences			X						X						X						X	
Economic Abstracts												X								X		
Fertilizer Abstracts																	X					
Food Science and Technology Abstracts			X																			X
Field Crop Abstracts					X																	
Health Aspects of Pesticides Abstract Bulletin				X					X									X				
Health Data Index																		X				
Meteorological and Geoastrophysical Abstracts		X																				
Nutrition Abstracts and Reviews				X																		
Search: Fertilizer Division																	X					
Statistical Abstract of the U.S.							X				X	X	X									
Other Services and Organizations																						
Agricultural Economics Research (USDA)									X													
Agricultural Pesticide Society Research Institute (Canada)					X				X													
Agricultural Research Service									X													
American Association for World Health																		X	X	X		
American Medical Association																		X				
American Meteorological Society		X																				
American Farm Bureau Federation																X						
American Foundation for Continuing Education													X									
American Society of Criminology										X												
American Statistical Association-Social Statistics Section											X											
Association for Childhood Education International													X									
Bureau of the Census											X											
Bureau of Labor Statistics (U.S. Dept. of Labor)														X		X						
Bureau of National Affairs														X						X		
Canadian Council for Research in Education													X									
Canadian Meteorological Service		X																				
Central Midwest Regional Education Laboratory												X										
Council of Economic Advisors												X								X		
Energy Research and Development Administration	X																			X	X	
Federal Council on Science and Technology	X														X					X	X	X
Federal Energy Administration	X																			X	X	
Fertilizer Institute																	X					
Food Research Institute (Stanford U.)			X						X													
Howard Center for Studies in Education and Development													X									

Table 6 (Concluded)

Trend Topics	ENERGY	CLIMATE/Weather	FOOD	Food Consumption	Food Production	Food Trade	VALUES/Social/Cultural	GENERAL TRENDS	Agriculture	Crime/Social Disruption	Demographic	Economic	Education	Employment	Environment	Farm Labor	Fertilizer	Health	International Conflict	Political Ideological	Resources	Technology
Other Services and Organizations (Continued)																						
Institute of Environmental Sciences															X						X	
International Association for the Advancement of Education Research													X									
International Association of Meteorology and Atmospheric Physics		X																				
International Congress of Food Science and Technology		X																				X
International Planned Parenhood Federation							X				X											
International Union for the Scientific Study of Population											X											
National Bureau of Economic Research												X										
National Council on Crime and Delinquency										X										X		
National Energy Information Center	X														X						X	X
National Fertilizer Development Center																	X					
National Institutes of Health																		X				
National Society for the Study of Education													X									
Population Association of America											X											
Population Council											X											
United Nations Department of Economic and Social Affairs											X	X										
United Nations Food and Agriculture Organization			X						X										X			
United Nations Industrial Development Organization												X							X			
United Nations World Health Organization											X							X				
U.S. Agricultural Stabilization and Conservation Service									X													
U.S. Bureau of Prisons										X												
U.S. Department of Health, Education, and Welfare							X						X					X		X		
U.S. Educational Resources Information Center													X									
U.S. National Center for Health Statistics											X							X				
U.S. Office of Business Economics												X								X		
U.S. Office of Education													X							X		
U.S. Public Health Service																		X				
U.S Weather Bureau		X																				
Western Regional Research Laboratory (USDA)									X													
World Meteorological Organization		X																				

factors, such as relationships to energy consumption, general economic conditions, and demand for pesticides, seem to be closely tied to these two dimensions. Fortunately, extensive data are regularly available on food price and availability from a variety of sources, both domestic and international. If anything, the problem will be one of careful selection from an overabundance of data.

Values--The final driving trend area, values, is by far the most difficult to monitor. Part of the problem is that there is no widely agreed on system for describing what values are and how they change. Further, the relationship between objective measures (e.g., consumer behavior, voting patterns) and value theory is not well developed. There are, however, organizations that perform value or value-related surveys, such as the Institute of Social Research at the University of Michigan; Daniel Yankelovich, Inc.; and Potomac Associates (reported in the annual "State of the Nation" reports). The value model used in this study is based on the theoretical work by Abraham Maslow and Clare Graves and was developed to its present state by Arnold Mitchell of Stanford Research Institute. The details of this are reported in the values trend paper in the Working Papers to this report. Mr. Mitchell is now developing and testing an approach for actual measurements based on this and other models.

General Trends

A number of other trend areas should also be monitored. These other trends cover such areas as economics, technology, demographics, education, and politics. Although the trends described in the previous section are considered to be major future-shaping trends, they are insufficient by themselves to provide a comprehensive picture of where we are going. Equally important, they cannot provide early warning on which trends might become especially significant in the future. Only a few years ago very few people, if any, would have seen energy or climate as central trend concerns. By studying as broad a range of trends as possible, one hopes to find clues to the emerging central issues. Thus the strategy is to monitor in depth the driving trends of energy, climate, food, and values, and in less depth a broader universe of trends. Table 6 presents a list of some of these and associated data sources. This list should not be considered as all-inclusive.

Futures Literature

One source for the ten scenarios presented earlier was the existing futures literature. As part of its monitoring effort, EPA should continue to look to that growing body of literature. Both substantive and methodological insights might come from such an effort. For the former, what is available generally are subjective interpretations of the implications of various trends. Two such sources used in this study were Robert Heilbroner's *An Inquiry into the Human Prospect*, and Peter Drucker's *The Age of Discontinuity*. Each provided a quite different image of the future. Since there is a high degree of uncertainty about the nature of the future, competing views should be monitored. Furthermore, the monitoring activity should not slight some of the better works of science fiction. "The Futurist," a publication of the World Future Society, is a good source of book reviews and relevant articles.

Monitoring the methodological literature can help improve the futures capability of EPA. Futures research is a relatively new field whose methodology is not highly developed. Although we like to think that this study represents the state of the art, it will need revising in time. Considerable effort is being expended on the development of better approaches to forecasting and on the use of futures research in the public policy process. Two journals in particular are excellent sources of articles and reviews: "Futures" and "Technological Forecasting and Social Change."

Issues/Events

The emergence or resolution of critical issues and the occurrence of major events can both be significant future-shaping forces. The civil rights movement of the early 1960s, the bitter divisions of the Vietnam War, and the assassinations of the 1960s have had and will likely continue to have significant effects on the shape of our society. We have presented the major significance of potential approaches to resolving the energy issue. The problem of monitoring such issues and events is that it is quite difficult to know in the early stages of their development which are likely to have long-range significance and which are likely to be ephemeral or narrow in impact. For example, will the women's rights movement have as profound an effect on the nation as the civil rights movement? Does the emergence of a leftist government in Portugal signal a leftward turning in Western Europe?

Clearly, there are many more issues and events that could be monitored than can realistically be managed in any organized system. What is required here is a kind of observational ruthlessness. The system can only hope to monitor a relatively few issues and events and their selection can only be subjective. However, if as time passes these issues and events seem to have little lasting meaning, then no matter how interesting they might be, they have to be culled from the system.

With respect to the selection problem, some guidance can be obtained from social observers, some of whom have been remarkably foresighted. Donald N. Michael of the University of Michigan, for example, in his book, The Next Generation, published in 1963, foresaw a number of the major social movements of the late 1960s and early 1970s. There are acute observers in a variety of places: the columns of the major newspapers, articles in selected technological journals, journals of opinion, and books.

Managing the Monitoring System

This subsection will present a discussion of the resources needed to operate a monitoring system: staff, materials (hardware and software/procedures), and data sources.

Staff

There are two kinds of tasks to be fulfilled in the monitoring function. First is the selection of information to go into the system. This must be done by the regular professional staff of EPA. Staff members must act as sophisticated readers, choosing the more useful items from the enormous amounts of paper that flow past them all the time. Further, they must read and cull regularly a number of assigned publications. The professional staff are the only ones who can judge what is most useful. Initially, it is inevitable that they will be less than selective; with time, as they gain experience in reading for monitoring, the number of items they actually mark for filing will diminish considerably.

The second task is the management of the system. The system manager's role combines the elements of being a librarian, a secretary, and a research assistant. The system manager must assign every item to a filing category, prepare it for filing (e.g., cut, paste, and mark), and assist the staff in finding information when needed. It is as librarian that the system manager must excel. Developing the most appropriate storage and retrieval system for the needs of policy planners requires both skill and imagination. Finding the right person to fill this monitoring system manager role will be difficult; few people have both the skills and the interest. As the system grows in scope it will almost certainly be necessary to add clerical assistance.

Materials

Two types of material are needed for operating an information system of this kind: hardware and software. Initially, and perhaps permanently, the hardware should be a standard, manual filing system. At some point in the future after the monitoring system has proved its utility, the use of computer information systems should be considered. However, a word of caution is appropriate here. Computerizing such a system is costly and difficult, both in development and operation. In fact, computerization may inhibit the system's usefulness by making casual but important browsing difficult or impossible.

The software needs include means for inputing, filing, and retrieving the data. As noted earlier, the monitoring system manager classifies the data and stores them in the appropriate file. The manager can also assist in the retrieval, though the data should be directly accessible to the staff.

The file structure is an important consideration. To ensure consistency and facilitate cross-referencing, we recommend the use of the New York Times Thesaurus File Names. In this volume almost any non-technical file name or an equivalent name can be found. Each name is fully cross-referenced and subcategorized. By using a standard reference, the problem of different people giving different names to the same topic is avoided. The ease of cross-referencing is important because any item will be located in only one file, and a seeker should be able to find an item by entering the system through a number of topics.

Data Sources

The abundance of data for monitoring purposes is both an advantage and a disadvantage. Some observers have pointed out that we seem to be drowning in a flood of data when what we need is good and timely information. The problem essentially is that of finding a useful selection strategy, choosing the sources that regularly provide helpful information, and rejecting those that are perhaps interesting but less useful. Again, ruthlessness is required; there are no hard and fast rules on selection of sources. We have listed in Table 6 a number of sources by topic because we have found topical referencing useful. Some of these topics will certainly be helpful. The process of selection will evolve with experience. However, the research librarian skills of the system manager will be helpful, particularly in identifying little-known sources.

Most of the data EPA should seek in continued monitoring will come from readily available sources at a relatively low cost. Such sources include major newspapers, relevant periodicals, and some primary data sources such as the Bureau of Labor Statistics. Subscriptions to expensive publications or data services are sometimes worth the cost, but careful consideration should be given to less expensive alternatives.

Using the Monitoring System

The basic objective of the monitoring system is to provide the policymaker with sufficient information to form a meaningful perception of the societal environment in which he is and will be making decisions. To that end two types of information are useful. First is that which allows perception of the broad social patterns that continually shape and change our society. Pattern recognition is best accomplished by the act of simply participating as one of the readers in the system and by occasional browsing in the monitoring system. The second type of information relates to data on particular issues of concern. This is the normal reference function of any information system: finding data on a specific topic when they are needed. In this sense, then, the objectives of the monitoring system are broad and specific, providing for both pattern recognition and reference. Within these two domains there are three primary uses for the monitoring system: evaluating scenarios, assessing the timing of trends, and identifying major new factors.

Evaluating Scenarios

Each of the ten scenarios is based on a set of assumptions about four driving trends and a number of subsidiary dimensions, (e.g., energy growth will be controlled, industry will be increasingly concentrated). As time goes by it will be possible to ascertain whether the assumptions contained in any particular scenario are actually being fulfilled. For example, Scenario 3, Apocalyptic Transformation, describes an attempt to sustain a high growth economy based on continued rapid growth in energy consumption. It should become apparent in the next few years whether this actually is the course we have embarked on; if not, then this scenario will most likely not describe the future. It is virtually certain that no one of the scenarios will precisely and accurately predict the future. However, even accepting this caveat, by checking the scenarios with the emerging reality, EPA will know better which ones most closely fit the actual situation and hence the potential future. Further, EPA will be in a better position to judge in what ways the current society is deviating from any scenario.

Each scenario is expressed in the form of a sequence of events that have an implied causal nature: earlier events bring about later events. Thus, if the earlier events that are monitored differ in some way from the scenario, does that necessarily imply that the later events described in the scenario will not come to pass? It is probably safe to assume that the actual future will deviate in some way from the path described; the timing, the intensity, and the effects of later events could be quite different. Thus, after evaluating the near future, it then is necessary to trace the causal pathway into the more distant future.

Timing of Trends

Related to the above suggestion is the question of timing. The scenarios all assume a 25-year horizon. However, it is quite plausible that the actual sequence of events might proceed more rapidly or more slowly than anticipated in the scenario. For example, several of the scenarios rely on the development of major new energy resources and technology in the 1980s. However, if that did not occur until the 1990s, the results might be quite different. Similarly, we assumed that major value changes in a society take place slowly, over decades. However, if values were to shift very rapidly and suddenly, the effects would be dramatic. Thus, in the monitoring function, EPA should be interested not only in the direction of the trends but in the rate of change as well.

Identifying Major New Factors

Before constructing the ten scenarios, the project staff reviewed a large number of trends and reduced these to four--energy, food supply, climate and values--considered most central to any discussion of the future. However, had we undertaken this study a decade ago we almost certainly would have ignored energy and climate and would probably have included the problems of race and poverty. Similarly, the future will certainly bring to the center of attention major areas of concern now considered secondary. It is also possible that one or more of the trends we have identified as central may turn out to be less important than we anticipated. For example, the current concern over climatic trends may be unwarranted in the long run. Thus, one of the purposes of broad monitoring is to provide early warning on what new trend areas might become central. Having identified a major new factor, it will then be necessary to see how its emergence would affect the scenarios already developed.

Modifying and Updating Scenarios

The ten scenarios presented in this report are unique in that they were written in the spring of 1975, based on information available at that time. Had they been written in 1970 they would be different, and scenarios written in 1980 will be still different. Scenarios will differ not only because of the particular data used, but also because of their unique perspective. Temporal bias is inevitable. We cannot escape our time-bound nature; both the past and the future are viewed only from the present. Although we believe that there are enduring images among the ten scenarios, we do not expect that all that we have written will stand the test of time. Therefore, EPA should consider these scenarios as starting points rather than as end points; they need to be regularly iterated, modified, and updated. Since it is obvious that these are not the only possible futures, EPA should consider writing additional scenarios on its own. These should be based on new information as it becomes available or on the possibility of "wild card" or unpredictable events. The following paragraphs will present approaches for this further work with the scenarios.

Modifying Existing Scenarios

The definition of each scenario was guided by the principle of internal self-consistency. Each element was considered in relation to all other elements to produce a self-consistent whole. This procedure is based on the hypothesis that on the whole a society is internally self-consistent. Although this is true in general, it is also true that local and short-term inconsistencies occur regularly; indeed, these inconsistencies are most often the sources of change. The society adjusts itself to make that element consistent. (For a more complete discussion of this process, see the Working Papers to the final report.

As the monitoring activity reveals either major unanticipated factors or new data on included factors, it will be useful to see how the scenarios might change, how the changed situation would affect all the factors at the time of its occurrence, and then to trace the repercussions of the change over time.

Developing Additional Scenarios

As stated earlier, the EPA should develop additional scenarios on its own. As new factors emerge, a wholly new scenario might be required to incorporate them. Also, the futures literature will certainly produce plausible descriptions of the future that may inspire additional scenarios.

To the extent possible, the scenarios produced in this study tried to avoid the researchers' biases on what is desirable, undesirable, or even probable. It may be helpful for EPA staff to produce scenarios based on their own desires, fears, and beliefs in what is probable. This can be especially helpful exercise in surfacing hidden assumptions which may have a profound effect on policy decisions.

"Wild Cards"

None of the ten scenarios are based on entirely unpredictable events. "Wild Card" (or stochastic) events include such things as major technological breakthroughs, wars, other cataclysms, and a dramatic religious revival.

It is virtually certain that some "wild card" events will occur and that a few will have major effects. For example, the successful development of a small-scale magnetohydrodynamic (MHD) power source could have dramatic affect on urban and rural population patterns, to say nothing of its impact on the energy problem; or the emergence of a charismatic leader to unify the Islamic nations could have profound impact on the whole world. Such events were not included in this study because they are limited in number only by the imagination of the researcher. If, however, there are "wild card" events that EPA deems potentially relevant to its mission, then it may wish to write new scenarios or modify existing ones based on the occurrence of that event.

In attempting to address the "wild card" problem, one important methodological issue must be considered: the problem of timing. With most such events, we have little data to deduce when they might occur. With some events we can establish limits to a degree; for example, commercial availability of nuclear fusion is virtually impossible in the next 5 to 10 years. Given an unanticipated breakthrough, the 15- to 25-year time-frame is not implausible. Thus the first step in using such stochastic events in scenarios is to determine whether any reasonable limits can be placed on them. (Another type of limit is the societal context. Some events may not be compatible with all situations.)

After the limits have been set, the event must be considered as having occurred in all the plausible time periods and settings. This will lead to subjective judgment on which particular time period and setting are most useful to develop into a scenario. More than one scenario may be necessary. For example, it would make a major difference to EPA's policy decisions if an unexpected breakthrough led to a cancer cure by 1980, by 1990, or by 2000. Three different scenarios might be written to cover those cases.

The trend area of climate produced a similar situation in this study. We could identify the major alternatives: variable, improving, or worsening. However, given the present data we could not say with certainty what the long-term pattern would be. Thus we were forced to consider all three variations in all the time periods. Before the study was under way, it had been anticipated that three to six scenarios would be sufficient to bound the uncertainty. However, because of the uncertainty of predicting climate, ten scenarios were required. Therefore, the introduction of such stochastic events rapidly multiplies the number of alternatives that must be considered.

Internal Policy Analysis

The futures research conducted in this study will yield several types of insights. The scenarios can provide guidance on what needs or demands the EPA must fulfill in the future. An example of a need for more precise proof was discussed in Section V. A second kind of insight is necessary to anticipate the problems that EPA may encounter in carrying out its mission. One such problem explored in this study is the anticipated lack of public support in the near term for economically restrictive environmental improvement measures. Still another type of insight is the emergence of new issues. Just as the energy issue has developed at least to some degree into a conflict between energy/economic growth/jobs and a clean environment, so the problems of climate/agriculture/food could affect pesticide control measures. A different type of insight can be gained from the process of testing potential policies against various scenarios to determine their suitability across a number of dimensions. The following discussions of analysis of internal policies by analytic methods, interrogatory methods, mini-scenarios, gaming, and policy workshops will present approaches to deriving such insights from the scenarios.

Analytic Methods

Section IV, Policy Methodology, presented in detail the analytic approaches used in this study. These are not the only methods that could be used. Here, "analysis" means the process of studying the scenarios to deduce patterns among them that provide insights of the type noted above. In each case this entails identifying the issues of interest (e.g., concern for long-term health risk), devising a way of extracting what the scenarios have to say about the issues, expressing that information in a way that is common to all scenarios, and finally comparing the results across scenarios and through time periods. In this study 16 policy issues were defined based on information provided by EPA. These 16 issues could be addressed in ways other than we addressed them. Other dimensions could also be considered as they become of interest.

Interrogatory Methods

If it is possible to frame issues as questions, then it is possible to interrogate the scenarios. EPA provided a number of such questions, two of which were:

> "What will be the changes in rural/urban mix of population and pesticide use?"
>
> "For home and garden users: How are their pesticide-use decisions likely to be affected by convenience, cost, availability of alternative control means, and other factors?"

In general, the first step in addressing these questions is to define the factors that affect the issue. For the population question, for example, the factors include such variables as energy availability, job availability and distribution, values, level of functioning of urban areas, and degree of regionalization. Once the factors are defined, first the four driving trends and then the other elements are studied to discover how each factor would be influenced in that scenario. From this procedure a series of conclusions can be formed. For example, in Scenario 3 one can conclude that, because of severe energy problems and a value change, there would be an increasing density in the urban areas, reduced density in the suburban areas, some migration from the northeast to the south and west parts of the United States, and increasing populations in the small towns in the south and west. On the basis of such conclusions one can then examine the implications for policy. It is obvious from the foregoing that deriving an answer to a policy question is a complex process, but once the procedure is followed for one scenario, it is less difficult for others.

The type of insight to be derived for policy purposes can be illustrated by the home and garden use question in the context of Scenario 3. We concluded that, because of economic conditions and value changes, home food gardening will increase rapidly in urban areas in the 1980s. This forecast would at least initially increase both pest problems and pesticide use in urban areas. Further, since the gardens will not be merely ornamental but an important source of food, the value of pest control to prevent losses would be enhanced. Since the people doing the home gardening are likely to be many in number, scattered, and relatively ill informed on pest control, the problems of pesticide control would be increased. To deal with this, EPA could begin in 1975 the process of acquiring the necessary data and devising the informational and regulatory mechanisms required.

Mini-Scenarios

Another way of gaining insights is to devise mini-scenarios in conjunction with one or more of the ten societal scenarios. A mini-scenario focuses on the future of a particular area of interest in the context of a specific societal scenario. Such areas of interest could include, for example, demographics, welfare, crime, and technology. The process for devising such a mini-scenario is similar to the interrogatory approach discussed above. The structural factors that shape the nature of the particular area are identified, and the scenario is analyzed to discover what it has to say, either directly or by implication, about those factors. In some cases an additional step may be necessary because not all the required information will be covered in the scenario and other forecasts dealing with that area must be added as input. This is particularly true of technological subjects where information on expectations of technical feasibility is essential. We have devised as examples two such mini-scenarios on the future of technological innovations in pest control, based on Scenarios 3 and 6. These two mini-scenarios make use of data from an ongoing SRI study on the future of third-generation pesticides.

Mini-Scenario Example 1

EVOLUTION OF PESTICIDE TECHNOLOGY IN SCENARIO 3

According to this scenario, the 25-year period from 1975 to 2000 is characterized as follows:

(1) 1975-1985 Continued high rates of economic growth and energy consumption, net improving climate, moderate food prices, and no food shortage.

(2) 1985-1995 Collapse of economic growth, short supply and surging costs of energy, net worsening of climate, high food prices, and food shortages.

(3) 1995-- Stabilizing economy in different value systems, zero or declining energy growth, high food prices but no shortage.

It can be argued that these conditions could well promote the evolution and widespread utilization of integrated pest management practices throughout commercial and home-style agriculture. Chemicals would still play an important role, but there should be reduced reliance on these products.

A small movement in this direction is already under way. In Scenario 3 this trend would probably see only modest growth in pesticide use at best into the middle 1980s. However, the ensuing energy decline would quite likely generate an important increase in chemical pesticide production, formulation, and application costs (in addition to a potential limitation in overall supply) to the point where other tools in pest management would have a significant economic advantage, and even become necessary.

By 1995 and beyond there is a high probability that a true pest management profession will evolve and that pest control districts will be established nationwide. Although chemical companies could be expected to experience some attrition, there should still be sufficient opportunity for companies with R&D programs to develop new pesticides. However, changes in the marketplace (e.g., raw materials and energy costs) should lead to a change in pesticide formulations. New products and their pricing and use patterns would probably be designed for use by professional pest management specialists rather than for general consumer applications.

Mini-Scenario Example 2

EVOLUTION OF PESTICIDE TECHNOLOGY IN SCENARIO 6

According to this scenario, the 25-year period from 1975 through 2000 is characterized as follows:

(1)	1975-1985	Economic recession and constraints on energy consumption, variable climate, high food prices but no food shortage.
(2)	1985-1995	Improving economic conditions, innovations in energy technology and decreasing costs, improving climate, improvement in food prices, and no food shortage.
(3)	1995--	Rising affluence, diffusion of innovative energy systems, constant and agriculturally adequate conditions, moderate food prices, and no food shortage.

The 1975-1985 period offers the best opportunity for the establishment of integrated pest management programs and for reduced reliance-on-chemicals concepts in pest control. The cost/price squeeze on growers will make them increasingly receptive to the recommendations of pest management experts that can save the growers money on escalating costs, like the cost of pesticides (to the extent that yields and marketable crop quality aspects are not penalized).

By 1985-1995 improvements in pest management, coupled with improved pollution control, may remove from the pesticide industry the stigma of undue hazard. On this basis, it is not expected that major innovations in pest control technology will be produced rapidly except on the basis of economic and marketplace justification. However, to the extent that viable pest management practices had become institutionalized through the Agricultural Extension services, incorporation into state university agricultural curricula, and establishment of commercial services relying on nonchemical and ecologically compatible techniques during Phase I, they would likely remain in effect throughout the remainder of the period.

Gaming

Policy gaming is a form of simulation that entails role playing. Within a given context, individuals assume roles relevant to a policy of interest. In this case the context is provided by the scenario. Typical roles might include policymakers, special interest groups, farmers, manufacturers, and members of Congress. The gaming approach is a good way to obtain a feeling for the future and to test policy alternatives. The process requires first framing an issue of concern in a way that facilitates identification of relevant roles, and then listing and assigning roles to the players. Next, the simulation of the policy issue is designed, including the time frame of the decision. The various actors are called on to formulate their positions on the basis of the scenario. Last, an attempt is made to formulate a decision. The entire process can be either brief or lengthy.

A good game involves both thought and action. Thus it is not enough to simply think the problem through; gaming must include the acting out of the decision process. The major value of gaming comes from the feelings engendered by the action or "experiencing the experience." It is also important to attempt gaming in more than one scenario. Both the nature of the roles and the issue can change to a surprising degree with a change in context. (For an excellent reference on gaming see "Serious Games," Clark C. Abt, The Viking Press, N.Y., 1970.)

Policy Workshops

All the above approaches can be addressed in the form of policy workshops. Before we discuss the details of such a workshop, we must make several general comments. The purpose of the workshop should be defined and made clear to all the participants. The agenda should be carefully designed and should not attempt to cover too much. Although advanced preparation is both important and useful, the requirements should not be too demanding on the participants because they simply will not do it. The actual workshop should be run by a skilled group leader whose focus is on the process and not the content. Whenever possible, the workshop should take place away from the work setting to avoid constant interruptions to creative thinking.

A scenario-based policy workshop might first attempt to review the results of the current monitoring effort in order to identify major new factors and to evaluate the probability and timing of scenarios. The scenarios judged most probable or most relevant in terms of policy implications should then be selected for further work. In the designated scenarios several major long-term policy issues or questions can then be identified. The issues and questions can be addressed to the workshop attendees analytically and/or interrogatively. Finally, policy alternatives could be tested in the form of a gaming exercise.

Workshops are not easily set up and they are expensive, particularly in terms of the time of the participants. However, our experience suggests that they can be enormously valuable both in actually dealing with substantive issues and in enhancing the anticipatory capability of the policymakers.

Using the Futures System

In summary, the use of the futures system, although it can produce significant benefits for the policy planner, imposes on him undeniable costs in the form of staff, space, hardware and software, and additional supervisory responsibilities. The system requires continual inputs and updating of information, as well as reexamination of assumptions and conclusions. Futures scenarios must be reviewed frequently and revised or discarded as necessary, and new scenarios must be constructed.

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Above all, the system, despite the human tendency to ignore distant future considerations in favor of concentration on near-term priorities, must be used regularly in the policy planning process. The futures staff and their resources must be made a part of the day-to-day policy planning activities of the organization. Most benefit is gained if a variety of modes--scenario interrogation, creation of mini-scenarios, gaming, and staff workshops--are employed.

GLOSSARY

Active--The individual (and societal) psychological response to a challenge situation is positive and dynamic in nature.

Adaptive--The society has a great capacity to respond to change and is highly resilient and flexible in the face of rapid social change.

Anticipatory action--Using available information to make sound judgments in order to foresee and prepare for future situations.

Centralization--A high degree of concentration of authority in institutional power centers.

Collectivist--The social attitude that supports mass efforts and promotes a sense of community.

Concentrated industry--A high degree of vertical and horizontal integration within industry.

Continuous--The organization, purposes, and dynamics of the social system do not suddenly alter, resulting in linear, progressive changes.

Corporatization--The dominant element in the unification of the world's economic institutions and organizations is the multinational corporation.

Critical threshold--That point in the balance of an eco-system beyond which the system is not supportive of life.

Cybernetic systems view--That perception of complex, interactive systems which recognizes the importance of the elements of communication and control within the system, but which respects the natural dynamics inherent in the system.

Cyclical--The perception of historical process that primarily recognizes repetitive patterns.

Decentralization--A high degree of dispersion of authority in institutional power centers.

Differential income distribution--The means of income distribution (i.e., economic institutions and organizations) result in the differentiation of income between individuals.

Discontinuous--The organization, purposes, and dynamics of the social systems change significantly and rapidly over time, resulting in numerous trend reversals.

Discrete view--Perceiving the parts of a larger whole as being separate entities that can exist without the support of, or without making a contribution to, a larger system.

Dynamic equilibrium--A state of a system in which the interdependent parts are continually adjusting and modifying in response to certain feedback, but in which the total dimensions of the overall system remain unaltered.

Epoch A--A period of sustained material growth that approaches exponential proportions. (Term first used by Dr. Jonas Salk.)

Epoch B--The period in which the growth potential is transferred from material to psychosocial concerns. (Term first used by Dr. Jonas Salk.)

Equalizing income distribution--The means of income distribution result in a more uniformly distributed income between individuals.

Evolutionary--The perception of historical process that recognizes man's psychological and spiritual growth and development.

First-order consequences--Only the immediate, short-term results of social action are considered by the decisionmakers when evaluating the impact of their policy decisions.

Fragmented industry--A low degree of vertical and horizontal integration within industry.

Globalization--The productive systems are organized globally because of either greater efficiency or of necessity brought about by political, distribution, or resource pressures.

High consensus--A significant degree of agreement among the members of society with respect to the issues that confront the society.

Homogeneous--A state in which diverse ethnic, racial, religious, and social groups tend toward assimilation into a common body.

Humanistic ethic--Belief in the worth and dignity of the individual and a reliance on intuitive, heuristic problem-solving techniques.

Images of man--The set of assumptions held about human beings' origin, nature, abilities and characteristics, relationships with others, and place in the universe.

Immature--The actions of society, as reflected in the decisions of its leaders, are spontaneous, reflexive, and lacking foresight.

Individualistic--The social attitude that finds virtue in the ability of the individual to make his or her own way even at the expense of the community.

Industrial--Characterizes a society that is preoccupied with establishing and maintaining high levels of material goods of production.

Information base--The collection and analysis of data provides the base from which institutional policy emerges.

Instinct response mode--Relying primarily on the reactive process without regard for either knowledge or insight.

Internal heterogeneity--Within the United States any number of varying life styles and value standards are tolerated with no single group dominating.

Internal homogeneity--Within the United States there exists one dominant life style or expression of values that has a low tolerance for aberrations.

International order--A world order in which some mechanism for international cooperation dominates the forces supporting nationalism.

Intuitive--Individuals and society tend to respond to problem situations in a subjective rather than empirical manner.

Knowledge elite--The pursuit of knowledge is an opportunity limited to a select, relatively small number of individuals who use the knowledge so gained to control the power centers of society.

Knowledge mass--Knowledge, and the resulting access to society's power centers, is widely held among people.

Lifeboat ethic--The dominant moral code of society that reflects the belief that an individual can justifiably turn away from aiding those less fortunate than himself.

Low consensus--A diminished degree of agreement among the members of society with respect to the issues that confront the society.

Managed systems view--That perception of complex, interactive systems which attempts to understand and effectively use the natural dynamics of the system.

Mature--The actions of society, as reflected in the decisions of its leaders, are responsible, deliberate, and rational.

Multiple-order consequence--The indirect, long-term results of social action are considered by the decisionmakers when evaluating the impact of their policy decisions.

Nationalization--Economic institutions and organizations reflect a sense of isolationism in that they operate, whenever possible, within national boundaries.

Nation-state--A world order that respects the sovereignty of individual countries.

Organic growth--The differentiated growth of specialized parts of an organic system according to a functional interdependence between the constituent parts. (Used by M. Mesarovic and E. Pestal in *Mankind at the Turning Point*.)

Passive--The individual (and societal) psychological response to a challenge situation is defensive in nature and characterized by withdrawal.

Physical ecology--Commitment to the belief that natural systems have a recognizable pattern or mechanism to their balance that must be sustained.

Pluralist--A condition in which diverse ethnic, racial, religious, and social groups maintain a degree of autonomy within a larger, common society.

Post-industrial--Characterizes a society that is relatively secure in its sense of economic well-being and its ability to sustain the means of production; therefore allowing a greater percentage of its time and energy to be devoted to services, leisure, and higher order (Maslowian) endeavors.

Production for profit/use--The degree to which the productive capabilities of the society are directed by a utilitarian or profit motive.

Productive systems--Refers to descriptors of a society that reflect the economic and knowledge production structure within the society.

Rational--Behaving in such a manner as to exhibit reason or understanding.

Rationalistic--Individuals and society react to problem situations in an objective, linear fashion.

Regionalism--A world order based on the cohesive forces of social/cultural/ethnic affinity among groups of nations, usually in the same geographic area; or, within nations, a sense of separateness and the need for autonomy in parts of the nation--as "the South," "the West."

Rigid--The society has a diminished capacity to change and a low level of resiliency and flexibility in the face of challenge.

Science response mode--An extended trust in the empirical process, with emphasis on data and information leading to knowledge.

Self-interest--The individual's image and concern for self is placed above that of society.

Social consciousness--The individual's image of himself as part of the social entity is dominant, and his concern for society as a whole is greater than his concern for self.

Spaceship ethic--The dominant moral code of society that holds that survival is possible for all only through cooperation and intelligent, coordinated action.

System collapse--Through the erosion of their organizational structure, the social systems are unable to respond to social problems, subsequently fail to perform their function, and are disregarded or abandoned.

System continuity--The social systems adjust to changing conditions and remain viable.

System malfunction--The social systems only haltingly respond to the challenges facing society but they continue to remain intact.

Systems analyst view--That perception of complex systems which attempts to manipulate the interaction of the dynamic elements within the system.

Systems view--That manner of perceiving large, complex systems (e.g., eco-systems) in such a way as to recognize their holistic, interactive nature.

Taoistic ecology--Recognizes that each organization and individual has an innate sense for growth and development that is to be freely expressed and not manipulated.

Technocratic ethic--A continuing reliance on the ability of rational thought, cybernation, and mechanization to solve problems.

Territorial ethic--The dominant moral code of society that recognizes the necessity and justice of sole control over the resources in an area by those who live in, govern, or "own" that area.

Undifferentiated growth--Replication of the individual parts of a system without regard for their role or function within the system. (Used by M. Mesarovic and E. Pestal in *Mankind at the Turning Point*.)

Valuing future generations--Society's concern for the condition of man is extended outward for succeeding generations.

Valuing present generations--Society's concern for the condition of man is limited to the current and immediately succeeding generation.

Watershed--A term used by Dr. Jonas Salk to mean the point of realization that Epoch A growth can not be sustained.

Wisdom base--The visceral, intuitive processes combine with the definitive, analytic processes to form the base from which institutional policy emerges.

Wisdom response mode--Trusting both the empirical and intuitive processes to yield insight as well as knowledge.

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Appendix A

TREND SUMMARIES

Appendix A: TREND SUMMARIES

Section II of the main text, Futures Methodologies, explains our use of trend data. Briefly, we collected trend data not to conduct original analysis into trend areas, but to acquire an overview of critical trend areas by drawing on existing literature. This overview allowed the project team to make informed and empirically based judgments when developing a range of plausible alternative future scenarios.

We reviewed a large number of potentially relevant trends and, from that universe of trends, selected a manageable subset that included trends of general relevance (e.g., international conflict, international social trends, energy) and trends of specific relevance to EPA (e.g., demand for pesticides, food supply and demand, ecological implications of pesticides). In consultation with EPA, we selected ten major trend categories for review:

- Energy
- Climate
- Supply of food and fiber and demand for pest control
- Demand for food and fiber
- Values
- Ecological implications of pesticides
- World societal trends
- International conflict
- U.S. agricultural foreign aid policy
- Outlook for cancer in the United States

Clearly, the foregoing areas do not exhaust all important trend categories. Given limits to resources and time, the ten selected areas seemed an adequate trend base from which to proceed. We acknowledge that some important trend elements almost surely have been overlooked or considered too briefly. These omissions will be ameliorated as this planning tool is used and refined in the future.

The trend summaries that follow provide a brief overview of the full trend papers. The complete trend papers (with references) are contained in the working papers in Volume II.

ENERGY

United States and global energy consumption has grown very rapidly in this century, with U.S. consumption doubling twice in the half-century between 1925 and 1975. Table A-1 shows the growth of energy consumption.

Table A-1

TOTAL AND PER CAPITA CONSUMPTION OF ENERGY

	U.S. Total Energy Consumption (trillion Btu)	World Total (trillion Btu)	U.S. Consumption per Capita (million Btu)	World Consumption per Capita (million Btu)
1925	20,879	44,249	180.2	23.4
1968	61,763	189,737	307.7	54.5
1975	80,000+ (projected)	--	--	--

Since the world data include the U.S. consumption, in 1925 the U.S. per capita energy consumption was about 13 times greater than that in the rest of the world. By 1968 that ratio had narrowed only to 8 to 1.

If the recent growth rate of 4.5%/year persists, U.S. consumption will double by 1990. There is considerable uncertainty in the range of forecasts; 180×10^{15} Btu/year by the year 2000 is the low forecast and 250×10^{15} Btu/year is the high. World energy consumption could rise to over 500×10^{15} Btu/year by 2000.

The less energy-intensive methods of agriculture (e.g., a rice paddy) are highly energy efficient but produce lower per acre yields than modern methods. The dramatic rise in U.S. agricultural yields has been bought in part by abundant and inexpensive energy. However, there is also a point of diminishing returns, where increasing use of energy does not produce a commensurate increase in agricultural yields. If energy becomes scarce and/or expensive, enormous gains in agricultural productivity may be threatened. Considered against the global food problem, this suggests a high potential for conflict.

Most growth in energy consumption has been in petroleum and natural gas, as may be inferred from Table A-2 below:

Table A-2

U.S. ENERGY SUPPLY, BY SOURCE

	Source (percent)		
	1920	1950	1973
Coal	78%	38%	18%
Petroleum	14	39	46
Natural gas	4	18	31
Hydropower	4	5	4
Nuclear	--	--	1

Coal production has leveled off since the turn of the century. Of the oil we use, 18% was imported in 1960 and by 1973 had nearly doubled to 35%. Importation of natural gas has also increased. At the current consumption rates all the world's proved reserves of both oil and gas will be exhausted by no later than the early part of the next century.

Although coal is still abundant, the environmental costs of extracting it and the safety hazards of underground mining are discouraging rapid expansion of production. In the short run this inhibition is compounded by the problem of conversion of boilers to coal burners and a shortage of mining equipment. Thus, in the short run we will have to rely on imported oil, particularly Middle Eastern oil, with all the attendant political and economic hazards.

The problems of new energy technologies, such as nuclear, solar, geothermal, and wind, are formidable. They are at best several decades away from making a significant contribution to energy supply. Conservation efforts can help, but they only postpone the energy consumption doubling time because they are one-time savings.

The rising level of affluence in this country has been made possible by ever-increasing use of inexpensive, plentiful energy. If that growth comes to a halt or slows dramatically, the continued expectation of rising affluence will also end, thereby potentially locking people into their current shares of the economic "pie."

Three major options for the future are being considered. The first is to let demand rise along its historical curve and then to concentrate on the development of new supplies, relying on new technologies to save the day when supplies are gone--a high risk course. The second option is to moderate growth through conservation, thus stretching supplies and allowing more time for the development of new technology. The third option is the low or zero-growth path through major systemic reorganization, which should result in a lowered material consumption level. The selection of any of these options (at present the second seems best), implies a future very different from the present.

CLIMATE

Climate (weather) may be defined as some combination of annual temperature, moisture, and wind patterns that determines a specific region's ability to sustain the production of desirable agricultural commodities in economic quantities.

In view of the evolution of agricultural production technology and the resultant heavy reliance on a land-based monocrop agricultural system, even modest vagaries in established weather patterns can have serious implications for the world population. For example, a potential corn crop of about 6.7 billion bushels in the United States in 1974 dropped to about 4.7 billion bushels because of weather; massive purchases of U.S. wheat in 1972 by the Soviet Union were made necessary by weather-induced shortages in the USSR; the periodic depression in fishmeal supplies from Peru are caused in part by unfavorable weather; and the relatively rapid decline of whole civilizations in the Indus Valley and other regions in ancient times is believed to have resulted from deterioration of agriculturally favorable weather patterns.

For the purposes of this analysis, short-term or spot variations in established climate patterns will not be considered. Despite the inherent difficulties in medium- to long-term weather forecasting, specifically as it pertains to selected regionalized agricultural productivity, this category, Climate, has been treated as a driving trend because of recent concern that the world's weather may be entering a period of decline (from an agricultural point of view). Current indications are sufficiently disquieting to counsel caution in making planning decisions without considering the increasing probability of agriculturally significant changes in climatic conditions.

This does not mean that the world is necessarily heading for mass starvation. However, the aggregation of recent analyses suggests that it would be imprudent to project future agriculturally based world food production under the assumption that future climate patterns will be similar to those experienced over the last 30 to 40 years.

Table A-3 lists and discusses some of the major implications of deteriorating weather on pest control and pesticides.

Table A-3

CLIMATE IMPLICATIONS FOR PEST CONTROL AND PESTICIDES

Item	Remarks
Crop value	Examples given in the text show that we really may be in the beginning stages of a declining weather cycle that, among other things, will gradually affect yield characteristics of certain agriculturally productive regions and crop varieties. At the least we may expect more irregularity in future weather patterns from year to year than we experienced over the past half century. If this occurs, then the chance for weather-related yield reductions and crop failures is greater; the need for other compensating yield-increase factors is greater; and the trend in per-acre crop values should increase. Even in the absence of potential yield-diminishing effects of climate, recent trends in per-acre crop values has been upward because of increasing world demand for food. With regard to the relationship between crop values and demand for pest control, it has been almost axiomatic that the greater the per-acre value of the crop, the greater the justification for: (1) optimizing yields per acre (e.g., by reducing competition from weeds with herbicides) and (2) protecting the crop from insect and pathogen damage.
Pest incidence	Pest incidence is often related to weather characteristics. Factors related to a declining weather pattern in agricultural areas that might increase pest incidence, particularly for insects and pathogens, would of course depend on the crop grown; but it might be expected that weather stress on specific crop varieties may make them more susceptible to infestations, particularly disease. On the other hand, weather-related reductions in per-acre crop yields may make crops less attractive to insects.
Changes in crop mix	Identifiable changes in weather patterns may bring about certain changes in crop mixes that will affect demand for pest control. If drought or even drier conditions hit certain regions, crops more suited to dry-land farming could be substituted for other varieties. In many cases this would represent only the substitution of one set of problems with another. However, if cotton acreage dropped significantly, certainly there would be a sizable net national decrease in the consumption of chemical insecticides (assuming that cotton currently accounts for close to 50% of the agricultural consumption of insecticides).
Utilization of weather in pest management systems	Although this item does not precisely fit the discussion of the effects of changing weather patterns on demand for pest control, it is worthy of mention. As suggested above under "Pest Incidence," weather conditions are an important determinant in the evolution of pest infestations up to or exceeding economic damage levels, and studies are under way to correlate daily weather conditions with variations in both the vitality of plants (hence, their innate resistance characteristics) and the vitality of pest populations. Periods of weather likely to lead to high pest levels can then be more readily identified so that timely and nonexcessive suppression measures can be taken.

SUPPLY OF FOOD AND FIBER AND THE DEMAND FOR PEST CONTROL

The demand for the economical control of crop pests, including insects, weeds, micro-organisms, and the like, will undoubtedly increase over the next 25 years. The significant trends that define this demand and have been analyzed include:

- Acreages, yields, and values of crops selected for their significant usage of pesticide materials in the past.
- Historical consumption of pesticide materials.
- Saturation levels of usage for specific classes of pesticides in important crops.

The historical time series of data defining the above trend components and the projection of these time series data result in the general conclusion that the demand for pest control will not abate. It is possible that the absolute consumption of pesticide materials could level off and perhaps decline, but this possibility is predicated upon several breakthroughs in technology and a significant change in grower practices. The increasing resistance of many pests to currently used pesticides, plus the apparent inability in the short run of new generation of pest control methods to reduce the absolute level of the pesticide applied, lends credence to our conclusion that the demand for pest control will certainly not decrease and will probably increase slightly each year.

Although we do not see a significant change in the acres to which pesticides are appled, we do see the yields and/or value of the crops on these acres increasing and costs of production increasing at least as rapidly. To remain financially viable, the farmer will be forced to optimize his combination of inputs to maximize his net return. The marginal productivity and value of pesticides is certainly very high relative to the other inputs of the farmer's total controllable input mix. Hence, from trend analysis and current issue analysis, we can see only an upward pressure on the demand for pest control out to the year 2000, assuming extrapolation from the present state of the world. This could be altered by the assumptions of the various scenarios that have been developed.

THE DEMAND FOR FOOD AND FIBER

Food Demand

In estimating food demand we must distinguish between actual consumption (effective demand) and nutritional need (adequate demand). Poor people in both developed and developing countries may not have the purchasing power to make their effective demand correspond to their nutritional need; conversely, the rich will likely have sufficient purchasing power to make their effective demand exceed their nutritional need. Since projections of aggregate demand and supply tend to mask these substantial disparities in purchasing power, the future demand for food is discussed in terms of both effective and adequate demand. The effective demand for food is primarily a function of three factors: the number of people in the world, individual levels of income, and individual preferences and customs.

Not only has the total number of people increased throughout history, but the rate of increase of our global population has accelerated. The world population is now growing approximately at the rate of 2% per year. Population forecasts indicate that global population will likely fall between the high projection of 7.1 billion and the low projection of 6.0 billion people by the year 2000. The rate of population growth in the United States, Europe, and the USSR has slowed considerably, thereby leaving the bulk of the world's population growth concentrated in three major regions: Africa, Latin America, and Asia. Although population growth rate is high in Latin America and Africa, these regions have substantial amounts of unexploited natural resources (primarily land and water). Thus there is some hope that intervention by developed nations with appropriate technology (pesticides, fertilizers, equipment) could begin to foster food self-sufficiency. The most critical problems are in Asia, where populations are already large (relative to available resources) and continue to increase rapidly.

The food problem has become more than a race between aggregate population growth and aggregate food supply--rising affluence has become a major new claimant on the world's food resources. For example, it is estimated that Americans consume more than five times as much food per capita as do Asian Indians because of their ability to enforce, through the market place, a disproportionate amount of indirect consumption of grains. In 1973 GNP per capita ranged from more than $5,000 in North America to less than $200 in many Asian and Central African countries. Even these striking regional disparities mask the low purchasing power of the very poor in many developing countries. Inequities in income distribution are even more pronounced in developing countries than in developed countries.

The distribution of world food supplies will likely remain a more serious problem than total production of crops and animals to meet growing demand. However, given vast differentials in purchasing power between and within regions, the world food dilemma will continue: there will be malnutrition and starvation in some areas while food surpluses accumulate in other regions. Adverse climatological changes could of course bring total production below anticipated levels and thereby translate the food problem into one of both production and distribution. In either event, although food shortages will likely be centered in the developing regions of Asia, Africa, and Latin America, the problem will manifest itself on a worldwide scale.

In summary, a brief sampling of expert opinion regarding the world food problem reveals a striking degree of unanimity. Even those who are optimistic about prospects for feeding the world's population consider the problem one of crisis proportions and view it as a continuing one, likely to endure at least to the year 2000. Solution or even amelioration of the problem will likely require heroic efforts and sacrifices on the part of the developed nations. Increasingly, the role of changing climatological patterns is seen as removing the element of predictability from food planning policy, thus requiring contingency planning for potentially volatile supply changes from year to year, depending on the vagaries of changing weather patterns.

Fiber Demand

The demand for fibers is related to the demand for food, not only because both food and natural fibers must be produced on a finite amount of crop land, but also because the same variables--population, income, consumer preferences--affect both food and fiber demand. Several additional components also affect fiber demand. In recent years dramatic shifts in two components, cost of petrochemical feedstocks and food crop acreage, have caused a turnaround in the rather sharp increases in fiber demand and left considerable uncertainty about future trends.

U.S. demand for textile goods in general and natural fibers in particular is shrinking. Synthetic fiber, which once represented only a miniscule share of total fiber production, claimed 70% of the market in 1974 and is expected to gain an 85% market share by 1980. Continued decline in the market share of natural fibers can be expected through the 1980s because substantial improvements in the price competitiveness of natural fibers seems unlikely.

Of the natural fibers, it is particularly important to consider cotton. Cotton is this country's only widely produced vegetable fiber and the only natural fiber requiring significant amounts of pesticides, often as much as a third of the total pesticide production. A sharp decline in cotton acreage is likely in view of current relatively low profit expectations for cotton and very attractive price prospects for cotton's main competitors: soybeans, corn, and grain sorghums. With cotton production costs likely to increase further, farmers are turning to lower risk food crops that offer a far greater profit potential. Thus, the combined impact of synthetic fiber competition in the market place and food crop competition in the field means further decline in cotton production. The nearly record production level of 6.2 billion pounds of cotton in 1973 should level off to an average of 4 billion to 5 billion pounds per year over the next decade.

VALUES

This trend paper examines U.S. society in terms of six life ways. These life ways are called "Makers," "Preservers," "Changers," "Takers," "Seekers," and "Escapers." Each is defined as a unique constellation of motives and values in such domains as life goals, psychological needs, belief systems, morality patterns, and time orientations.

The population of the United States in the mid-1970s appears to be composed of about a third Preservers and about a fifth each of Makers and Takers. Combined, the three smaller groups of Changers, Escapers, and Seekers make up about a quarter of the population. This profile suggests that about three-quarters of the population (Preservers, Makers, and Takers) are reasonably in tune with cultural norms while a fourth of the people basically desire a change.

An analysis is presented to suggest that changes in national profiles of life ways is a useful way of looking at societies. Some observations are offered on the role of values in societal change. Values appear to be both the creators of change and the result of shifts in the external environment.

These comments are generalized to show how national life profiles may be interpreted to explain key events of a society's history. In a cursory review, U.S. history from 1776 to 1975 is examined for shifting life way patterns.

The paper concludes by indicating three plausible kinds of futures for the United States, each with a distinctive life way profile and hence with unique patterns of values. A brief scenario is postulated as the route to a "transformational future." An outstanding feature of this scenario is the hypothesized emergence of a new life way called the "Mover." The Mover, by combining many of the qualities of Makers, Preservers, Changers, and Seekers, could assume the leadership role in creating a workable and satisfactory post-industrial system.

ECOLOGICAL IMPLICATIONS OF PESTICIDES

"Pesticides" is a generic term that includes herbicides, rodenticides, insecticides, fungicides and others. These chemicals, along with fertilizers, are among the most important man-made inputs that go into modern, high yield agriculture. Thus, in a world required to produce increasing quantities of food to avert massive famine, it seems only logical that increasing amounts of pesticides will be used. Yet there is also the disturbing feeling that in killing organisms inimical to human purposes we may eventually impinge too closely on man himself. Indeed, when we consider the introduction of over 1 billion pounds of pesticides annually into the domestic ecosystem, a seemingly common sense dictates that we should also consider whether we may be fostering a seemingly irresolvable, but nonetheless plausible, dilemma: that of choosing between restricting pesticide use domestically and restricting pesticide exports abroad when restriction contributes to massive starvation and/or malnutrition, or gradual poisoning of large populations as substantial quantities of pesticides are used in an attempt to increase food supply to meet increasing domestic and international demand. At present, there is little evidence to support the emergence of such a dilemma. Nonetheless, since the publication of Rachel Carson's Silent Spring, there has emerged a new level of public uncertainty and anxiety regarding the wisdom of high and sustained levels of pesticide use. Thus, for both psychological and potential (some of which are largely unknown) biological reasons, there is cause for concern. A preliminary balance sheet reflecting the pros and cons of pesticide use is presented on the following page:

Benefits	Costs
Increased crop yields	Killing nontarget species
Increased crop quality	Indirect human health effects
Increased crop certainty	
Less need to diversify crops	Direct poisoning of humans (during production and application)
Enhancement of economies of scale	
Savings on labor costs	Increases in pest resistance
Public health (e.g., mosquito control)	

On balance, then, the case for increased pesticide use seems to outweigh the case for substantial pesticide restriction; the benefits are relatively certain and near term whereas the costs are relatively uncertain and long term (and thereby subject to substantial social discounting). Despite the aggressive pesticide use policy implied by the foregoing, there is additional reason for caution. Meadows et al., in Limits to Growth (1972), discuss an important attribute of ecosystems when a toxin is introduced:

> Whenever there is a long delay from the time of release of a pollutant to the time of its appearance in a harmful form, we know there will be an equally long delay from the time of control of that pollutant to the time when its harmful effect finally decreases. In other words, any pollution control system based on instituting controls only when some harm is already detected will probably guarantee that the problem will get much worse before it gets better. Systems of this sort are exceedingly difficult to control, because they require that present actions be based on results expected far in the future.*

Since we do not know with any degree of confidence how pesticides are degraded and dispersed in the environment, we are literally conducting a large-scale experiment on ourselves--and all other living things--

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*Quoted from pp. 83-84

without sufficient controls to make the experiment a safe one. Thus, such uncertainty seems to argue as much for being overly cautious as for proceeding with uninhibited application of pesticides.

On the other hand, since pesticides are intentional biological poisons, we naturally assume that they represent a first-order environmental hazard. Yet man introduces many other contaminants into the environment, and it is by no means clear that these "unintended poisons" do not represent a greater health and environmental hazard than do the pesticides. We may be concentrating our attention disproportionately on contaminants that are relatively innocuous when viewed from the perspective of both intended and unintended poisons. Clearly, much more research is needed.

WORLD SOCIETAL TRENDS

There is a considerable divergence in world societal trends over the period. World societies are grouped as (1) nonsocialist developed nations; (2) socialist (USSR and East European) developed nations; (3) high potential lesser developed nations (chiefly Middle East and North Africa and some Latin American and African nations); (4) low potential lesser developed nations; and (5) China.

The two major societal factors influencing trends in all nations are population and population growth rates and possession of or access to raw material resources (including arable land and fresh water).

In Group 1, societal patterns associated with high rates of economic growth, high rates of consumption, materialism, and individualism will tend to be modified over the period to compensate for reduced access to raw materials. Alternative trend possibilities are maintenance of existing patterns to the greatest extent possible for those who can afford them and increasing numbers forced to adopt other patterns generally associated with the term "culture of poverty"; or the adoption of patterns more compatible with equitable sharing of a less rapidly "growing pie." The latter trend is more likely to evolve in the homogenous societies of Japan and Western Europe where traditional, preindustrial social forms still retain some viability. The United States could go either way, but institutional momentum gives more likelihood to the former.

Group 2 countries will most likely preserve their existing societal patterns under conditions of improving material conditions over the period.

Group 3 nations--the only ones, by and large, that will show significant societal change under improving material conditions during the period--will largely succeed in retaining and adapting their most positive distinctive cultural and social patterns. At the same time they will experience difficulty in rooting out patterns (e.g., seclusion of women, pro-natalism, conspicuous consumption) not compatible with a period of rapid development and modernization. Most, especially the Islamic nations, will tend toward a pattern of nonindividualist egalitarianism that resembles the East European pattern than the U.S. model. Others, particularly some of the smaller states of the Persian Gulf, will be less inclined toward egalitarian patterns.

Group 4 nations can be subdivided into two categories: those that have sufficient per capita resources and the will to adapt traditional agrarian patterns to the construction of viable, subsistence societies; and those that lack either or both of the above and tend toward divided societies. In divided societies a modern sector closely tied to developed countries (particularly those of Group 1) imitates to the limit of the nation's resources the North American or European patterns while a traditional sector undergoes more or less rapid societal breakdown.

The anomalous case of China, involving as it does the arrest of a long-term trend toward societal breakdown and the adaptation and redirection of traditional societal institutions for the creation of a large-scale, viable (so far), subsistence society, is one that a number of Group 4 nations (particularly in Central Africa) are attempting to emulate.

Key factors in determining the societal trend direction in Group 3 and Group 4 nations is the extent to which elite groups are united with the mass of the population ethnically and culturally and the extent to which the local culture is perceived as superior or equal to that of the developed countries. Where, as in much of Latin America, there is ethnic and cultural division, the tendency toward split-level societal development will be strong. The same can be said of India, Indonesia, and particularly the Philippines. The reverse would be true of most of the Arab countries and some of the Southeast Asian nations.

INTERNATIONAL CONFLICT: 1975 TO 2000

The trend projection sees only a low probability for armed conflict among the developed nations. The high probability is war in the Middle East; a lower one is war between the Soviet Union and China. However, in the former case, even if hostilities between Israel and the Arabs reoccur, the likelihood of direct big power intervention on either side is small and, as the oil situation continues to grow in importance, diminishing.

The probability of direct military action by one or more of the developed nations to ensure access to sources of raw materials held by a lesser developed nation increases over the time period. However, such action would be undertaken only when the aggressor nation ascertained that action would not provoke counteraction by another developed nation.

During this period there is high probability of international conflict among lesser developed nations, caused by population pressures, religion and tribalism, and control over sources of raw materials. Such conflicts will tend to be ignored by the developed nations.

Disputes among elites over control of limited wealth in lesser developed nations, ethnic-based secession movements, and, in some cases, broad-based revolutionary movements will contribute to a significant amount of civil warfare during the period. Again, there will be a decreasing tendency for the developed nations to involve themselves directly.

A very low probability is assigned to "nuclear terror" in which nuclear-armed lesser developed nations mount credible attacks against rich nations to secure a distribution of wealth. So long as controlling elites in the lesser developed world are able to profit through relationships with the developed countries, this sort of tactic is most unlikely. A slightly higher probability might be given to the use of nuclear weapons by a lesser developed country that is invaded in a dispute over access to raw materials.

Nuclear attacks carried out by nongovernmental groups (or even by individuals) carry a higher probability. However, even where such use is identified with some political or ethnic movement, an attack of this type can hardly be defined as international conflict.

Even where the highly probable civil wars and conflicts between lesser developed nations are protracted, battles will tend to be fought at a low technological level. The effects on humans may be severe, but significant environmental effects will be limited to those traditionally associated with war, i.e., deforestation, disruption of irrigation systems, breakdown of disease control systems.

AGRICULTURAL FOREIGN AID POLICY

During the next twenty-five years the United States will continue to be the major source for the export of basic foods to the rest of the world. The role of food supplier of last resort will be great or small depending on the development of trends in climate, population, agricultural technology, and political/social/economic policies throughout the rest of the world that affect the supply of food. The manner in which the United States plays its role will be a function of American foreign policy.

Three possible foreign policy trends are:

(1) The United States may decide to use its agricultural strength to support an internationalist/hegemonic policy. Food will be viewed as a weapon to be sold or given to friends but denied to foes. Friends and foes will be defined in terms of their support for American world leadership.

(2) The United States may adopt an internationalist/cooperative policy in which it seeks to use its agricultural productivity as a resource for strengthening the world community. Food production and distribution policies will be coordinated with multinational agencies on the basis of mutually agreed on objectives.

(3) The United States may adopt neoisolationist policy in which neither hegemonic leadership nor mutually cooperative roles are actively sought. Foreign policy considerations play a less important part in the determination of agricultural policy.

THE OUTLOOK FOR CANCER IN THE UNITED STATES

Cancer will probably remain an important future cause of death among the U.S. population. However, the degree to which cancer is prevalent in the future may vary according to the ways in which our society evolves. Three future scenarios, Survival, Achievement, and Frugal, offer these different prospects for cancer:

- A survival sector may imply declines in the social cost of cancer and in the ability to predict its occurrence.
- An achievement sector may imply a better ability to predict cancer and substantially higher social and treatment costs.
- A frugal sector may imply a better understanding of the psychosomatic components of cancer and a better prognosis for prevention and cure.

The degree to which cancer can be detected, prevented, or cured in individual cases may be uniquely dependent on the quality of the short- and long-term relationships between individual patients and doctors. This relationship is felt to be most enhanced in the frugal sector.

The issues listed below are addressed in the context of the three alternative futures:

	Alternative Futures*		
Issues	Survival	Achievement	Frugal
Ability to predict cancer	↓	↑ ↑	↑
Change in per-case treatment costs	↓ ↓	↑ ↑	→
Outlook for a cancer cure	→	↑	↑ ↑
Social cost of cancer	↓	↑ ↑	↑

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*The population sectors in the ten scenarios have been used here as whole scenarios of the future (i.e., survival equates with industrial failure; achievement equates with industrial success; and frugal equates with industrial transformation).

Appendix B

FUTURES LITERATURE

Appendix B: FUTURES LITERATURE

As part of the alternative futures methodology developed in this study, we incorporated a review of futures literature. After screening many works, we finally settled on sixteen as most useful to this study. They were selected to include a diversity of views of the future--views which were derived in a variety of ways. In this way we hoped to reduce the effects of our personal biases as well as methodological biases on the outcome of the study.

The full reviews are available in Vol. II, Informal Working Papers. In this appendix we present brief summaries of these reviews. They are intended to provide the reader with sufficient information to be able to understand the references in the report to the authors or the works themselves.

The Coming Post-Industrial Society by Daniel Bell (1973)

Bell's social-scientific essay on the future is essentially optimistic, foreseeing evolutionary change in which the necessary economic and socio-political adjustments are made and serious trauma is avoided. Environment, resources and food are not seen to be critical problems. The most important problem--which Bell believes will be solved--is developing new forms of institutions to manage the change to a communally oriented distribution, political, and scientific system. Fewer people will be employed in direct production, and more in services of all sorts, especially scientific and technological. His vision relies very heavily on the intensive, successful but judicious application of technology. Despite the radical change in the nature of employment which Bell foresees, the types of social and political institutions characteristic of today's industrial societies undergo little, if any, change.

The Sheep Look Up, by John Brunner (1973)

This novel is a very gloomy scenario of ecological catastrophe. Brunner anticipates that. over the coming decades, people will adapt to and accept a slowly deteriorating environment as necessary to the continuation of a high consumption society and economy. Only a series of major disasters will waken them to the dangers. But, by then it will be too late and the U.S. will collapse in chaos. This disaster is the result of the dominance of economic considerations over environmental ones, the pervasive power of big corporations to act in their own interest at any cost, and the wasteful overconsumption of the U.S. populace.

Stand on Zanzibar by John Brunner (1968)

In this novel Brunner presents a scenario of a slow erosion in the overall quality of life. If The Sheep Look Up is the end "with a bang" scenario, this is a story that ends "with a whimper." Things get slowly worse, largely as a result of the inexorable pressure of population growth, though not dramatically--we are "muddling through." The urban areas are the worst with ever higher levels of violence and chronic unemployment. The major political development, foreseen by Brunner in 1968, is the growing strength of the resource-rich, underdeveloped world.

The Age of Discontinuity, by Peter Drucker (1968)

The next twenty-five years will, according to Drucker's social-scientific speculation, be marked by a dramatic and rapid shift of many functions now assumed by government into the hands of the giant multinational corporations. Acting in an interdependent fashion they will reduce the gap between the have and the have-not nations. However, if they fail (because of government interference), the likelihood of class war is quite high. The knowledge producing sector will be the key actor in the transfer and successful use of economic and political power.

The Mature Society by Denis Gabor (1972)

The "mature" society in Gabor's speculative essay, is one that bases its choices on rational, scientific wisdom rather than on prejudice and emotion. Carefully directed science will result in social rather than technological innovations. These new institutional forms will be able to provide a moderate level of affluence and opportunity for all. The government will increasingly and successfully be able to manage all aspects of society, including the transition to the low growth economy which is necessary because of environmental and resource considerations.

An Inquiry into the Human Prospect by Robert Heilbroner (1974)

In this very dire personal statement Heilbroner asks the question "Is there hope for Man?" and answers essentially "no." He believes that present economic and political systems (capitalistic and socialistic alike) will be unable to cope with the real problems of population growth, limited resources, environmental degradation and nuclear terrorism. Capitalist democracies will collapse first, giving way to various forms of revolutionary socialism. But they, too, will ultimately be unable to cope with the insoluble problems of industrialism and will give way to a world characterized by rigid, highly authoritarian societies, the only ones capable of controlling production and consumption in the interest of human survival. The reasons for this lie in people's inability to voluntarily restrain their consumption and to identify beyond the nation-state or the present generation.

The California Tomorrow Plan, Ed. by Alfred Heller (1971)

This book, published by a citizens action group, presents two views of the future of the state, i.e., California One and California Two. It advocates the adoption of policies which lead to the realization of California Two. The essential issue tackled in California Two is the nature of public planning and decision making process. If the present nonsystem persists, the problems of society, especially environmental and social, will get worse. On the other hand, a better future will result from the evolution of a rational, comprehensive, participatory planning system.

Things to Come: Thinking about the 70s and 80s, H. Kahn and B. Bruce-Biggs, 1972.

This book, which looks ahead only to the mid-1980s, is essentially optimistic. Though the authors acknowledge that things could get worse, that will only occur if the Western democracies lose their "nerve," i.e., their commitment to unregulated corporate capitalism. Wealth and consumption will continue to grow rapidly. We will become more ecologically conscious, but not to a degree that might impair economic growth. There will be no problems associated with resources and food. Technology and human ingenuity will act to eliminate potential shortages in either. The one major danger is nuclear war.

Changing Images of Man, O.W. Markley (project leader) (1974)

This SRI report explored the nature of man's image of himself. After studying a number of images of man (e.g., economic, scientific, mythic, etc.) the research group concluded that the industrial era guiding image of man is no longer appropriate and even potentially harmful in the context of the current situation. For example, many of our current problems (e.g., pollution, resource shortages, etc.) are the result of too much economic success. If we are to have a more positive future, then a new image of man must evolve which is centered around two themes--a self-realization ethic and an ecological ethic.

The Limits to Growth, Dennis Meadows, et.al. (1972)

This highly controversial book was the result of the first major computer modeling effort aimed at a systems understanding of the whole world. It was initiated by the Club of Rome, an unofficial international group concerned with the fate of humanity. The study reached the conclusion that unless all forms of exponential growth (e.g. population, resource use industrialization, pollution, etc.) were limited soon, the global industrial civilization would collapse in the next century. This shift toward an equilibrium state must begin immediately or the momentum of growth will be uncheckable without serious consequences, as we overshoot the limits of a finite earth.

Mankind at the Turning Point, by Mihajlo Mesarovic and Eduard Pestel (1974)

This book was the result of the second stage computer modelling effort by the Club of Rome. On the basis of regional rather than global analyses, it concluded that undifferentiated growth is a problem. The growth we have traditionally experienced is called undifferentiated--everything grows simultaneously. We now need to move toward organic or differentiated growth, where some parts of the system grow, while others contract. One immediate and practical aspect of this is the transference of the target for growth from the developed to the underdeveloped world.

Lifeways and Lifestyles, A. Mitchell (1973)

This proprietary SRI report is a detailed analysis of changing human values. The scenario developed by Mitchell is of a transition to a post-industrial society over the next few decades. This society will be collectively oriented, inner-directed, focused on individual growth, internationalist, ecologically aware, socially responsive and accepting of low economic growth. The transition, however, will not be a calm one. The 1980s will be an especially difficult time as the clash between the old order the the new comes to a head.

An Organized Look at the Future by Pacific House (1972)

Two future scenarios are developed. One is an optimistic view of major social transformation. This change is embodied in changing values and lifestyles, accompanied by major changes in political and economic institutions. The other is a "muddling through" view. Things change, to be sure, neither noticeably for the better nor drastically for the worse.

Ark II by Dennis C. Pirages and Paul R. Ehrlich (1974)

Pirages and Ehrlich argue that our present industrial system is heading for collapse as we confront severe resource limits and the inability of the ecosystem to absorb pollution. These twin effects have their roots in the basic nature and purposes of our society; therefore, it is these which must change if we are to successfully adapt to the new reality. One key aspect of their proposed response is more government planning and regulation.

The End of the Dream by Phillip Wylie (1972)

This novel was social critic, Phillip Wylie's, last book. It is a carefully worked out scenario for ecological doomsday. He argues that even if we are ecologically aware, the socio-political system is incapable of responding quickly enough to ward off the impending disaster. That disaster is being brought on by a reckless destruction of the environment in order to feed an insatiable addiction for ever-higher levels of consumption.